PLAN Series™

System Service Manual

NESTAR

LA40-0400-1

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2585 E. Bayshore Rd., Palo Alto, California, 94303
(415) 493-2223 Telex 171420 Nestar PLA

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How to Use This Manual

This manual is designed for use by network service representatives who install and maintain PLAN SERIES-based systems. The manual does not provide information on detailed intraboard, component level troubleshooting or board repair.

Further information will be found in the PLAN Series Physical Planning and Installation Manual and the PLAN File Server Installation and Operation Manual. A complete bibliography of PLAN Series manuals and guides appears at the end of this manual.

Warning: This equipment generates, uses, and can radiate radio frequency energy. If not installed and used in accordance with the manufacturer's instructions, it may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

We welcome criticisms and suggestions. Forms for reporting program errors and documentation errors or inadequacies are provided at the back of this manual.

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Chapter 1

Principles of Operation

1.0 System Overview

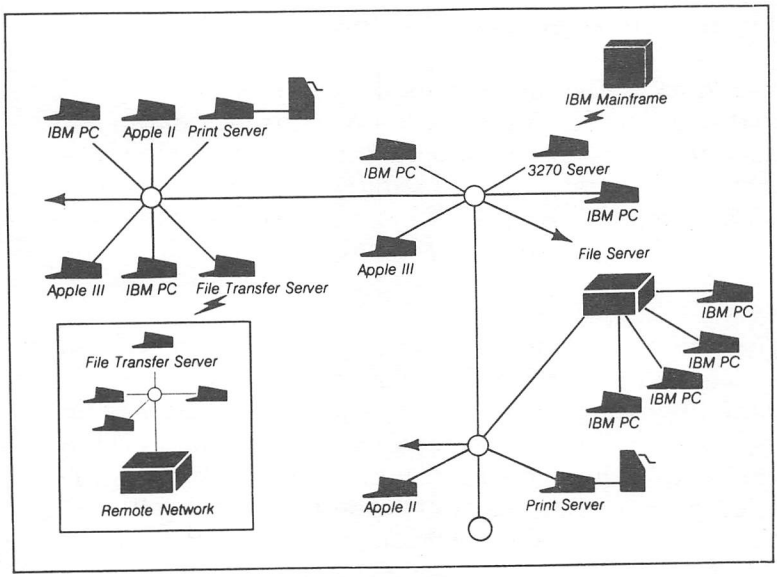
The PLAN Series network is a local area network (LAN) that uses packet transmission and token arbitration. The network consists of a logical ring, which is created when an 'invitation to transmit" token is sequentially broadcast to all nodes on the network. (A 'node" is a user station, file server or general server unit.) (Figure 1-1)

The network is physically implemented by cables (coaxial, fiber optic or IBM Cabling System) interconnecting user stations and a file server. Each user station contains a network interface card (NIC). These NICs differ for each type of network station host in order to match the station internal bus. Each station's cable is connected to its NIC.

The network cable from a user-station NIC joins the network by attaching to a multiple-port junction box called a HUB. HUBs can be "active" or "passive". An active HUB is a line isolation and wiring concentrator device that provides signal regeneration, signal conditioning, fault isolation, and multiple ports. Active HUBs can be "internal" (in older models) or "external" to a floor-standing file server; HUBs are always external to the desktop file server. Passive HUBs split signals but do not regenerate or condition them. Passive HUBs are "external" to all file servers. Multiple HUBs can be used. They are interconnected using the same kind of cable that connects nodes to HUBs. Active HUB ports are 'ideal' in that they have no insertion loss, yet eliminate reflections, even from unterminated lines.

Figure 1-1

PLAN Series Network



Any of the ports of an active HUB can be connected to another node, to another HUB, to an unterminated length of network cable, or to nothing at all. Each port of a HUB consists of a line driver and receiver identical to those in the NIC. In its idle state, the HUB enables all receivers until one begins receiving a transmission. The HUB then disables all other receivers and feeds the transmission from the active port to the transmitters driving all the other ports. At the end of a transmission, a timeout before re-enabling receivers, ensures that no reflected signals are fed back from any unterminated lines.

0, 1, 2, or all HUB ports may be fiber-optic cable ports. All other ports are used with coaxial cable.

The passive HUB (which serves as a signal splitter) is a junction between one or more NICs and, optionally, active HUBs. The passive HUB attenuates the signal in the process of impedance matching to the coax cables. Its sole purpose is to provide additional, economical ports to the network. It has a number of important limitations, outlined in Section 1.6 below.

1.1 System Protocol

The network uses a contention-free token passing protocol that guarantees network access to each node within a known short period of time. Each node has an opportunity to send data before explicitly passing control of the network to another node. Because this "token" pass is always to a designated node, there is no competition for control of the network.

Each node is guaranteed a turn at exclusive control of the token. Stations that want to transmit on the network detect the token and in turn transmit a packet along on the network. Once in control of the network, the sending station transmits "ENQ" ("Free buffer inquiry"), and gets back from the receiver NAK or ACK, (NAK has no

free buffer, ACK can receive to free buffer). Receiving an ACK, the sending station then sends out a single packet. For "broadcast" messages, the packet is sent with no ENQ beforehand and no TMA is returned. (Broadcast messages are sent out to the unique, nonexistent address $00, for any stations that are enabled to receive them. No reply is expected. Broadcast messages have a number of applications on the network.)

The receiving station accepting the packet will send an ACK back to the sending station, which will generate a Transmitted Message Acknowledgement (TMA), providing that the packet was received correctly (i.e., that the CRC matches). Once its packet has been transmitted, the sending station passes control to the next station by sending the token to the node with the next existing sequential address. Every active node is thus explicitly polled.

While one node transmits, all other nodes listen. Only the addressed node captures the transmission for its user. Any node can hold a dialogue with any other node. The only exception is for "Broadcast" messages, where any node can receive the transmission if enabled for broadcasts.

Each network is restricted to 255 stations.

Each node (either user station or server station) has a unique identification address between 1 and 255. No address has any special priority.

In general, any node can have any ID and can be connected anywhere in any physical sequence on the network cable. However, as a consequence of software design in the PLAN software, the first file server in any network should be should be given the hexadecimal address $FE. By convention, additional file servers on the same network should be addressed with station ID's descending from $FE. Thus, the second file server in a network should be $FD, the third $FC, and so on. After

the network configures itself, each node knows its own ID and the next higher ID only.

Note: ID 0 must not be assigned to any station since it will prevent the NIC from booting and hang the machine. Address 0 is used to indicate a broadcast to all stations.

When a node receives the token from the next lower node it either passes the token to the next higher node or transmits one packet and then passes the token on. No node holds the token for more than one packet transmission, which is limited by hardware to 512 bytes.

1.2 Network Reconfiguration

Network reconfiguration is an automatic network recovery procedure. Reconfiguration (recon) is initiated when a node determines that there has been no bus activity for 78 microseconds. If a node hasn't received the token after 800ms, it will initiate a recon by destroying the token. The node destroys the token by transmitting a sequence of 1's long enough to overwrite the token, stopping transmissions until the 78 ms timeout occurs.

The token can fail to circulate because an incident (node failure or noise) destroys the token or because the token has been purposely destroyed by a newly powered-on node.

Starting with the highest ID node, each node repeatedly tries to pass the token to sequentially higher ID nodes (255 passes to 0) until a node accepts the token. The node sending the token remembers only the address of the next highest node (NID). Reconfiguration takes from 24ms to 61ms, depending upon the number of stations.

When leaving the network, the departing node is seen as not accepting the token within a certain time limit by the node below it, and this node then locates the next

highest ID, without requiring a full reconfiguration.

The node with the highest ID ($FF, if it is on the network) starts the token. $FF sends the token to $00. $00 is not permitted on the network, however, and after 74ms, the $FF tries to send the token to $01.

The network supports joining nodes and excludes departed nodes automatically, without user intervention or loss of data.

See Chapter 5 for more information on reconfigurations and troubleshooting.

1.3 Network Topology

Network protocols impose very few restrictions on the transmission medium: the receiver at any station must be able to hear the transmitter at any other station, any two stations must be connected by a single path, and the path between any two stations must have a propagation delay of 31ms or less.

Using RG62 coaxial cable, the network has a maximum station to station limitation of 22,000 feet. NIC to HUB and HUB to HUB distance is restricted to 2,000 feet, but up to 10 HUBs can be chained together. Passive HUBs are restricted to a maximum total length of 200 feet. Two Passive HUBs must not be physically connected. No more than 10 HUBs can be connected between any two stations.

Using fiber optic cable, station to station distance is limited to 17,000 feet. NIC to HUB and HUB to NIC distance is restricted to 4000 feet.

Signal propagation between any two stations on the network cannot exceed 32 microseconds.

The network topology is unrestricted, (except that there must be no loops), and any configuration using multiple HUBs is possible, (Figure 1-2).

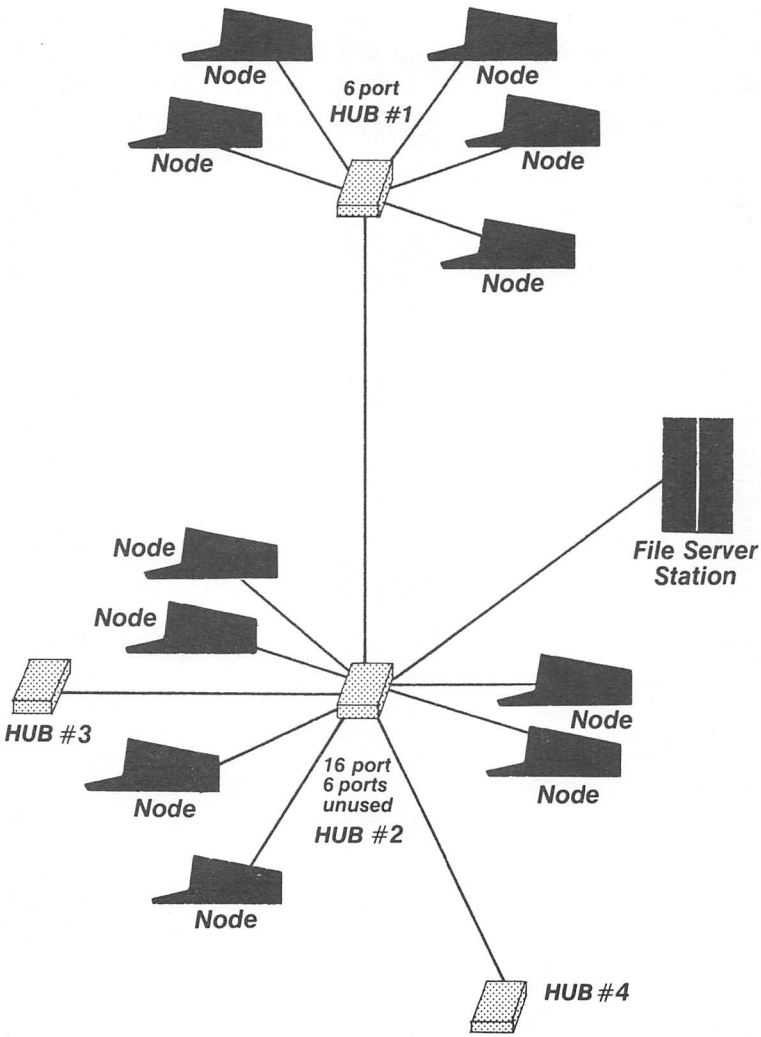
The network uses coaxial, fiber optic, or IBM Cabling System cable.

For coaxial, use RG-62A Coaxial Cable (solid core conductor) or RG-62B Coaxial Cable (stranded core conductor), and standard 75 ohm BNC connectors. For crimp connections, the solid core RG-62A should be used. Stranded core is used for solder connections. The cable must pass EIA standards for RG-62 (93-ohm). It can be cut to any length less than 2000 feet with no tuning, balancing, or other maintenance required.

For fiber optic, use Raycom standard 200-micron fiber cable. (Fiber optic cables cannot be used with passive HUBs.)

Figure 1-2

Network with Multiple HUBs



1.4 File Server

Floor-Standing Model (PLAN 4000)

The file server manages access to shared storage and backup facilities on the network. The floor standing model (PLAN 4000) consists of a cabinet labeled "file server" and (optionally) from one to four cabinets labeled "storage" (Figure 1-3).

The cabinet labeled "file server" contains an optional 8" hard disk, a high speed tape drive for backups, a disk/tape controller card, power supplies, and a card cage (Figure 1-4) containing:

1. a CPU card
2. a Peripheral Interface Card (PIC)
3. up to three internal HUB cards (on older models)

Each cabinet labeled "storage" contains a 14" hard disk.

The file server manages the hard disks shared by all users on the network, and can handle up to 4 hard disks with a total capacity of 548 megabytes of formatted storage.

To back up the disk, the server has a built-in high speed tape unit with 20 or 45 megabyte capacities.

Nine slots in the multibus card cage allow the addition of peripherals.

Line Isolation Devices (HUBs) permit up to 29 user or server stations to link directly to the server. Additional external HUBs can also link to any number of the 29 ports on the server to expand the number of stations on the network to a maximum of 255.

Network protocols are handled by a custom silicon chip that resides on the Peripheral Interface Card (PIC). Hardware implementation results in a raw coaxial cable

transfer rate of 2.5 megabits per second or fiber-optic transfer rate of ?? per second..

The CPU card contains a 68000 processor running at 8 MHZ with 256K bytes of memory and RS232 ports supporting a console or modem.

System diagnostic programs, system back-up and storage management are controlled by the file server The server supports a variety of operating systems in workstations.

Additionally, the server software includes utilities for comprehensive volume management (e.g. listing the network directory hierarchy, displaying internal information about volumes, deleting entire directory heirarchies and copying entire real or virtual diskettes).

Desktop Model (PLAN 3000)

The desktop file server manages a single 5.25" hard disk. To back up the disk, the server has a builtin 20 or 45 megabyte tape unit. A disk/tape controller regulates the disk and tape accesses. An internal HUB is not included (Figure 1-5).

A card cage in the desktop unit (Figure 1-6) contains both CPU and PIC boards, which are identical to those in the floor-standing model. Floor-standing and desktop file servers run the same software, with a few minor exceptions.

Figure 1-3

Floor-Standing File Server, Dual Cabinets
(Front View)

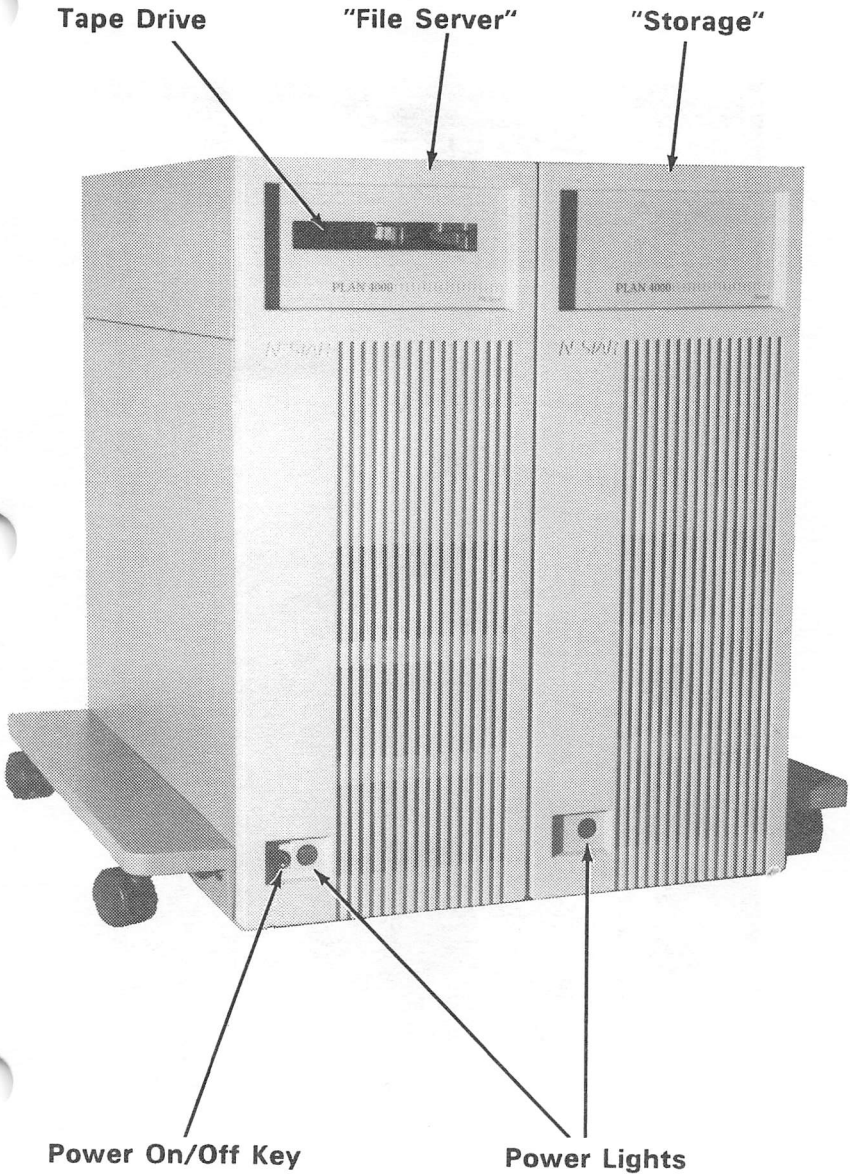


Figure 1-4

Card Cage
(Floor-Standing File Server)

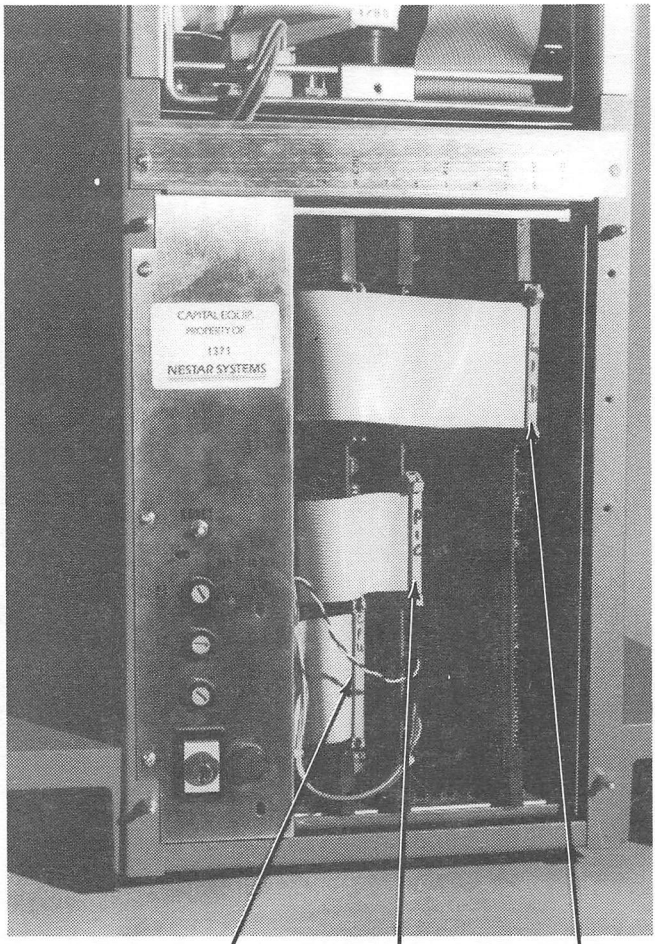


Figure 1-5

Desktop File Server

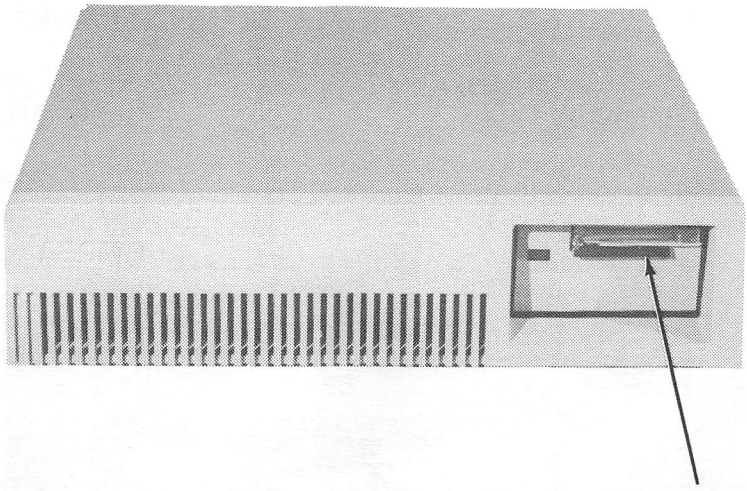
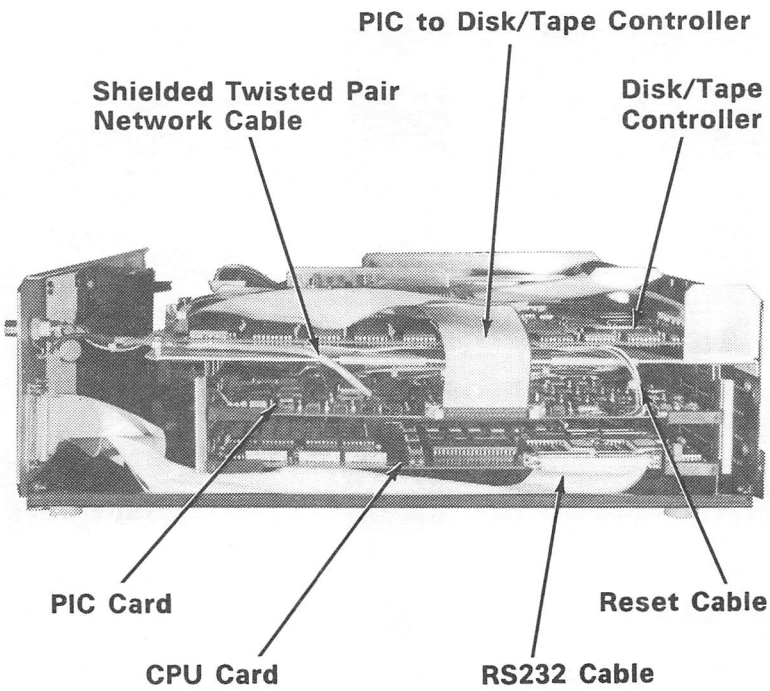


Figure 1-6

Card Cage
(Desktop File Server)



1.5 Peripheral Interface Card (PIC)

The Peripheral Interface Card (PIC) controls the CPU card access to the network, to storage and backup facilities. The PIC (Figures 1-4, 1-6, 1-7) contains:

1. network interface
2. interface to disk/tape controller
3. clock/calendar
4. programmable interval timer
5. optional DES for encryption and decription

1.6 Line Isolation Device (HUB)

The HUB is a multiple port junction box (Figure 1-8). It functions as signal regenerator/conditioner and active splitter. Each port can be connected to a NIC, to another HUB, to an unterminated length of network cable, or to nothing at all. Each port of the HUB consists of a line driver and receiver identical to those in the NICs.

A passive HUB, which serves the function of a splitter, is a junction box. The passive HUB is a simple attenuating DC impedence matcher. Its purpose is to provide additional economical ports to the network.

Because the passive HUB is a simple attenuator, its use is more limited than that of an active HUB. Whereas the maximum coaxial cable length on any active HUB port is 2000 feet (609 meters) for coaxial cable, the sum of all cable lengths used with a passive HUB cannot exceed 200 feet (61 meters). In addition, a second passive HUB cannot be "daisy chained" to a port on the first passive HUB.

Violation of cable rules results in unreliable data transmission and unpredictable results.

HUBs contain 0, 1, 2, or all fiber optic ports, depending upon the model. The rest of the ports connect to coaxial cable.

Early PLAN 4000 file servers may contain "internal" HUB boards.

Figure 1-7

PIC

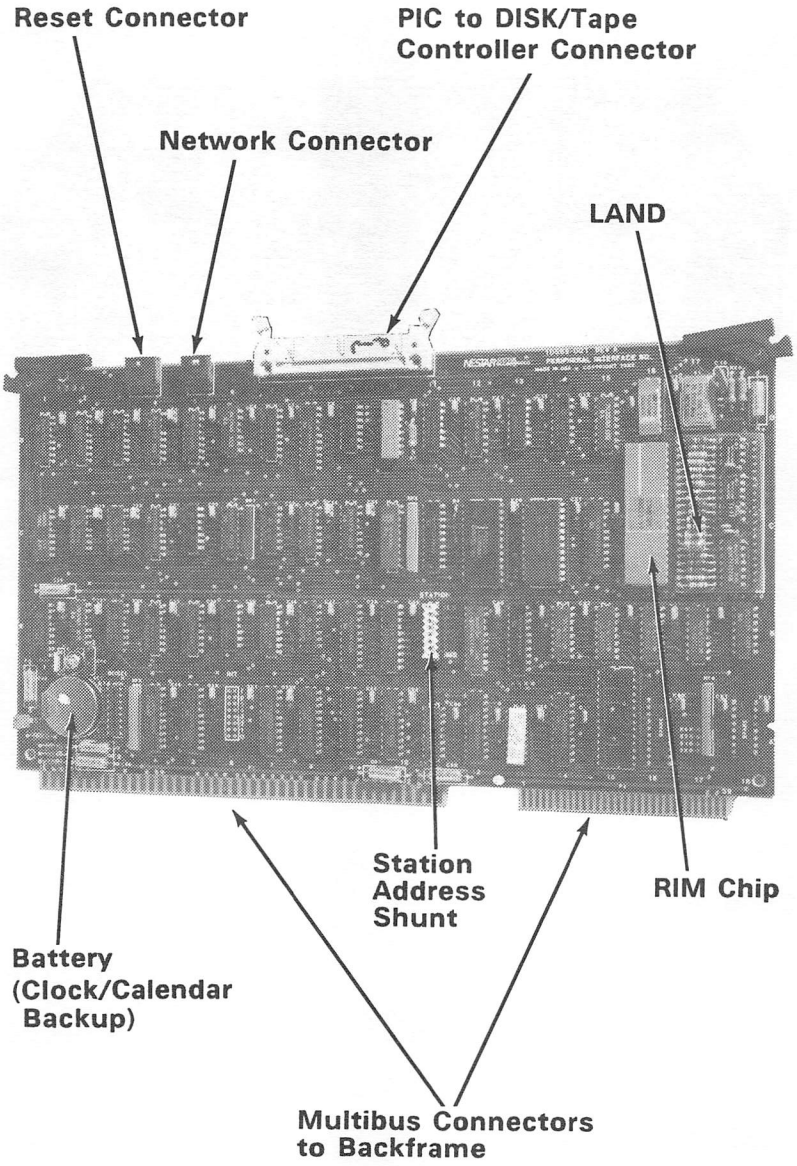
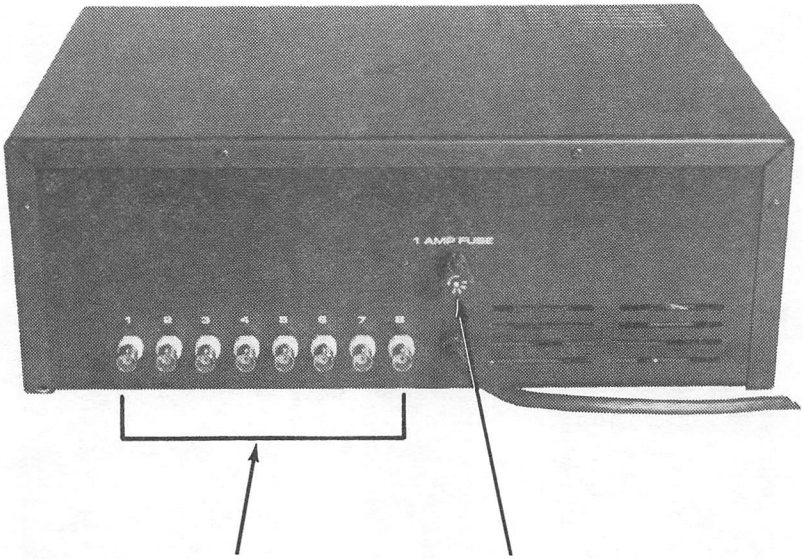


Figure 1-8

8-Port External HUB



Network BNC Connectors (Hub Ports)

Fuse

1.7 68K CPU Card

The CPU card (Figures 1-4, 1-6, 1-9) accepts data, processes instructions, performs processing operations and delivers the processed data.

The CPU card runs the file server software and other offline utilities. It manages the directories on the disk. Additionally, it controls user station access to virtual volumes with multiple levels of security, and provides services to user stations (time of day, resource locking, etc).

1.8 Disk and Tape Controller

This controller provides, on one printed circuit board, (or, in some cases, a board with a piggyback board), a complete disk controller, tape controller and host interface (Figures 1-10, 1-11, 1-12, 1-13).

The controller supports data rates up to 2.0 Mbytes/sec per burst and 450 Kbytes/per sec continuous. Backup and restoration commands are transparent, the host being able to access a disk even when such commands are being executed.

The simple host interface requires eight data lines, four address lines, and three control lines (READ, WRITE, and RESET). In addition, the controller provides all signals necessary to support DMA and other system control features.

The controller can handle up to four disk drives (5.25" in the desktop model or 8" and 14" in the floor-standing model) and up to four tape drives (20 or 45 Mbyte). It can back up 10 megabytes in less than two minutes.

The controller has six basic functional blocks:

1. on-board microcontroller
2. serial data sequencer

3. three floating data buffers
4. host interface
5. disk interface
6. tape interface

The onboard microcontroller includes a Z-80 CPU, EPROM, RAM, and I/O control circuitry. It reads the command register, initiates host commands and updates the status register at command completion. Due to the high data rate of the controller, the microcontroller only initiates the transfer sequences through its I/O circuitry.

The serial data sequencer performs serial to parallel data conversion for disk data and the CRC error check on the serial data stream. It works with the disk interface to handle all disk data transactions.

The microcontroller handles all data transactions with the three floating data buffers. It can assign them individually to any of the host, disk, or tape data buffers, to execute a data transfer in "bucket brigade" fashion. First, it assigns an empty buffer to the source device. When the buffer is full, the microcontroller assigns it to the destination device and assigns the next empty buffer to the source device. The buffers rotate in this fashion, full ones from source to destination device, and empty ones back again, until the transfer is complete.

The three interface blocks generate the necessary interface signals for the disk, tape and host, and provide terminations for inputs and drivers for outputs. Each interface includes data bus, address bus and control signals.

Figure 1-9

CPU

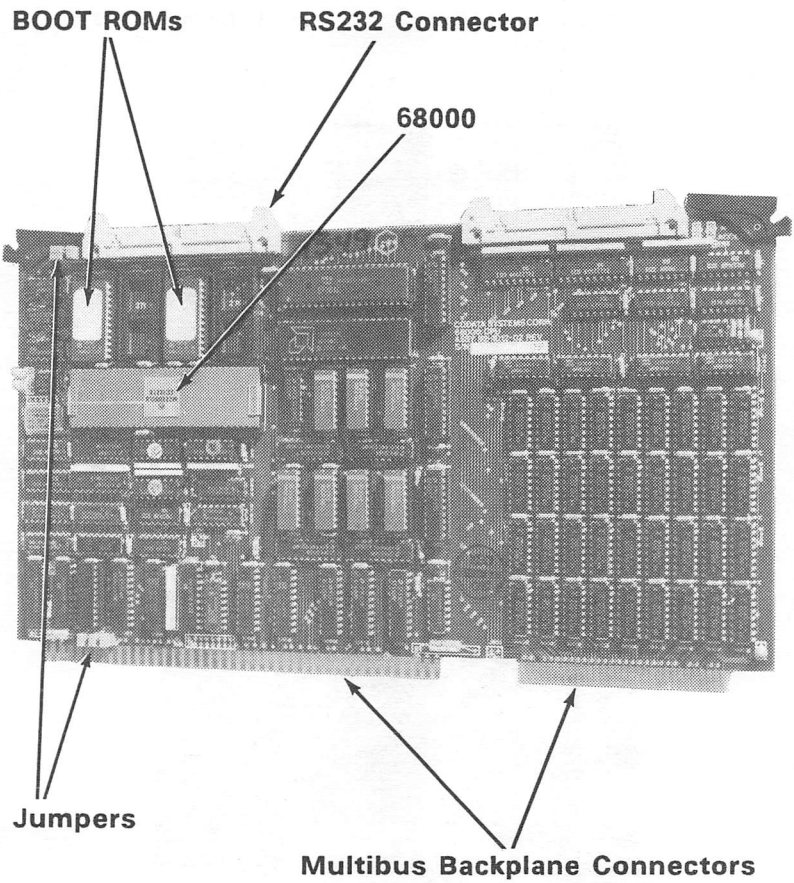


Figure 1-10

Disk/Tape Controller
Multilayer Version
(Floor-Standing Model)

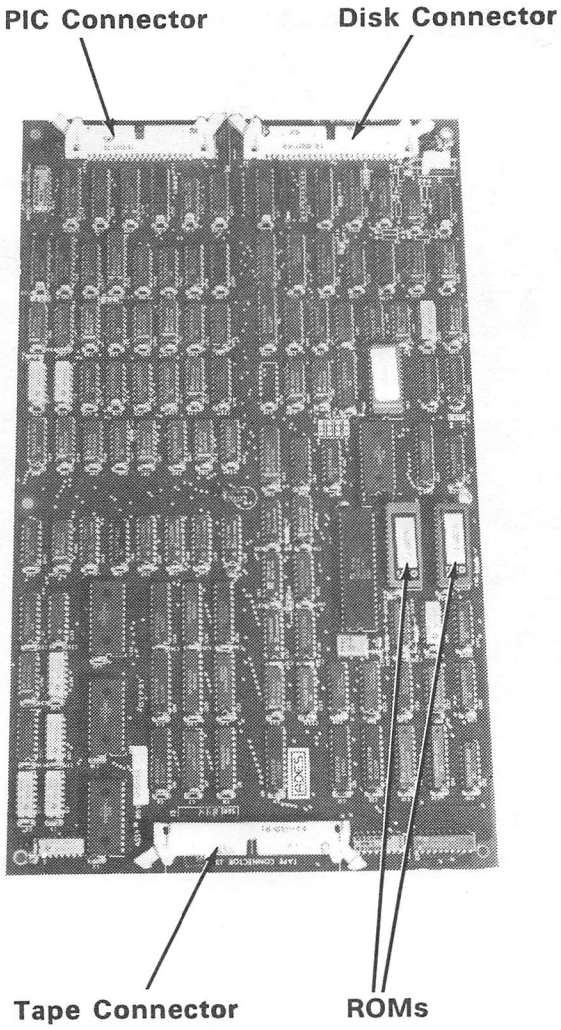


Figure 1-11

Disk/Tape Controller in Floor-Standing Cabinet

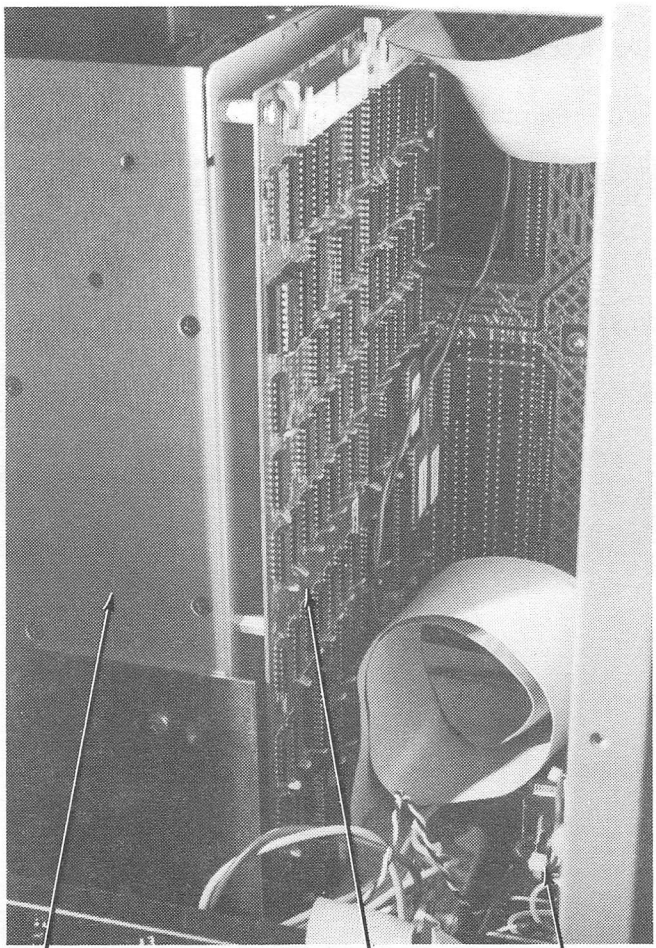


Figure 1-12

Disk/Tape Controller
(Desktop Model)

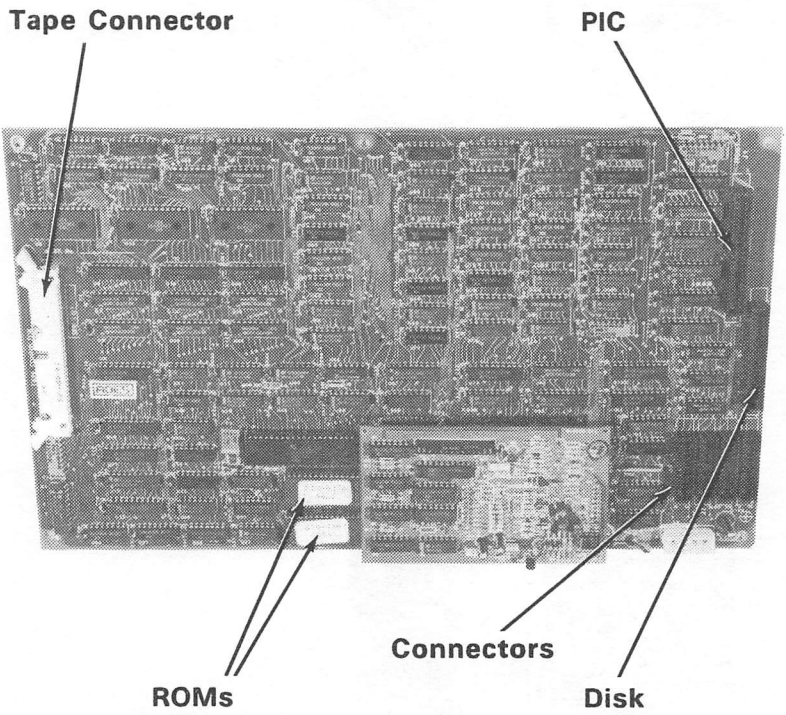
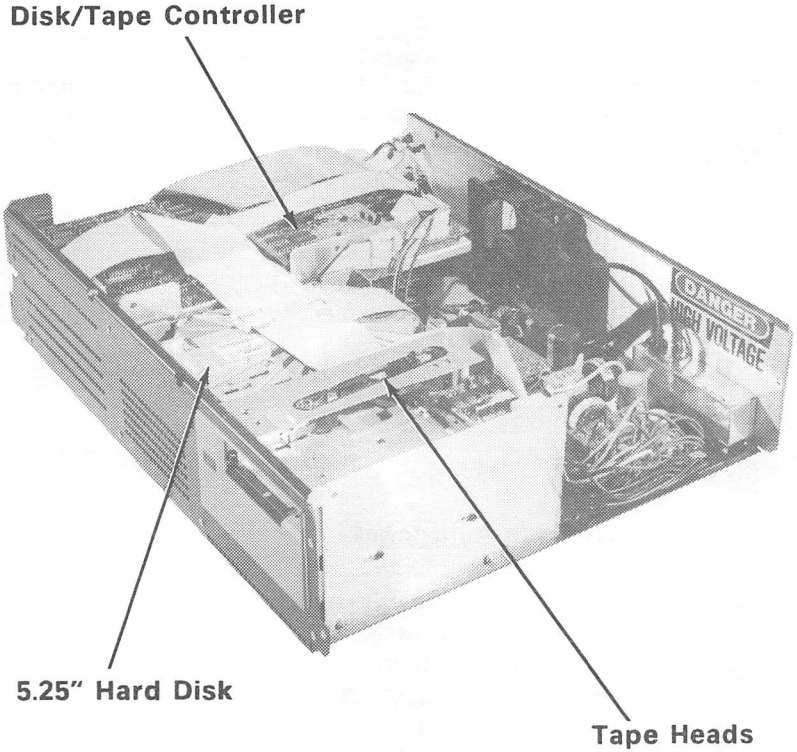


Figure 1-13

Disk, Tape and Disk/Tape Controller
(Desktop File Server)



1.9 Hard Disk Units

The desktop file server supports 5.25" Winchester disk drives (Figure 1-13). The 5.25" disk drives have capacities of 10 or 15 MB of formatted storage.

The floor standing file server supports both 8" and 14" Winchester disk drives (Figure 1-14).

The 8" disk drive has a capacity of 60 Mbytes of formatted storage and the 14" disk drive has a capacity of 137 bytes. A single floor-standing file server can support up to 4 8" or 14" disk drives with a total maximum capacity of 548 Mbytes.

DISK PERFORMANCE

10 and 15 MB Disk (5.25")

varies according to model

60 MB Disk (8")

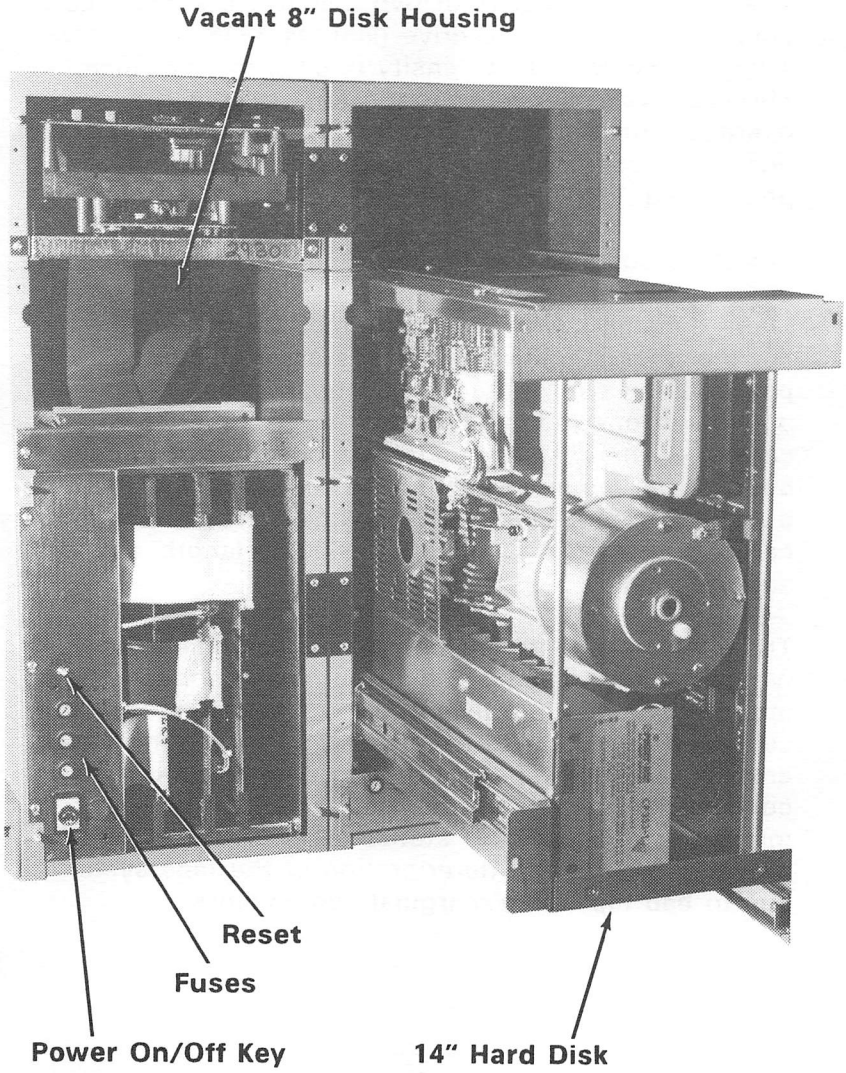
Track Format: 256 Byte Blocks
Transfer Rate (Mb/sec): .806
Track to Track Seek Time: 8 msec
Average Seek Time: 42 msec
Maximum Seek Time: 75 msec
Average Rotational Latency: 8.3 msec
Cylinders per Disk: 1049
Bytes per Cylinder: 58,880

137 MB Disk (14")

Track Format: 256 Byte Blocks
Transfer Rate (Mb/sec): 1.04
Track to Track Seek Time: 8 msec
Average Seek Time: 40 msec
Maximum Seek Time: 75 msec
Average Rotational Latency: 9.7 msec
Cylinders per Disk: 1,121
Bytes per Cylinder: 123,648

Figure 1-14

14" Disk
Dual Cabinets
(8" Disk housing vacant)
(Floor-Standing File Server)



1.10 Tape Unit

Floor-Standing and Desktop Models

The tape unit is a low cost, high performance mass storage device. The unit provides 90 ips tape speed and 20 or 45 Megabytes of user data storage.

The tape drive consists of two components, the tape controller and the tape drive (Figures 1-13, 1-15, 1-16). Tape recording density is 8000 bits per inch. The tape controller relieves the host CPU of the overhead functions associated with tape formatting, tape error processing, file mark processing and tape positioning.

The drive contains a magnetic recording head, capstan drive motor, tape hole sensors, "cartridge in place" and "safe" sensing switches, all mounted on the drive frame. For the floor-standing model, the drive electronics are packaged on two printed circuit boards, one mounted above and one mounted below the installed tape cartridge. The desktop model has two printed circuit boards, one mounted behind the cartridge slot, the other below the motor and head assemblies. The drives employ a cartridge-held 25" tape, 450' or 600' in length, as storage media.

The intelligent controller contains independent read and write channels, three 512 byte buffer memories, a host interface, a drive interface and a microcomputer. The controller microcomputer makes tape formatting, tape error processing, tape positioning and tape motion controls transparent to the host system. The microcomputer provides statistical error data, which prevents progressive deterioration of the tape system due to bad tapes and marginal components.

Figure 1-15

Tape Drive Unit
(Floor-Standing File Server)

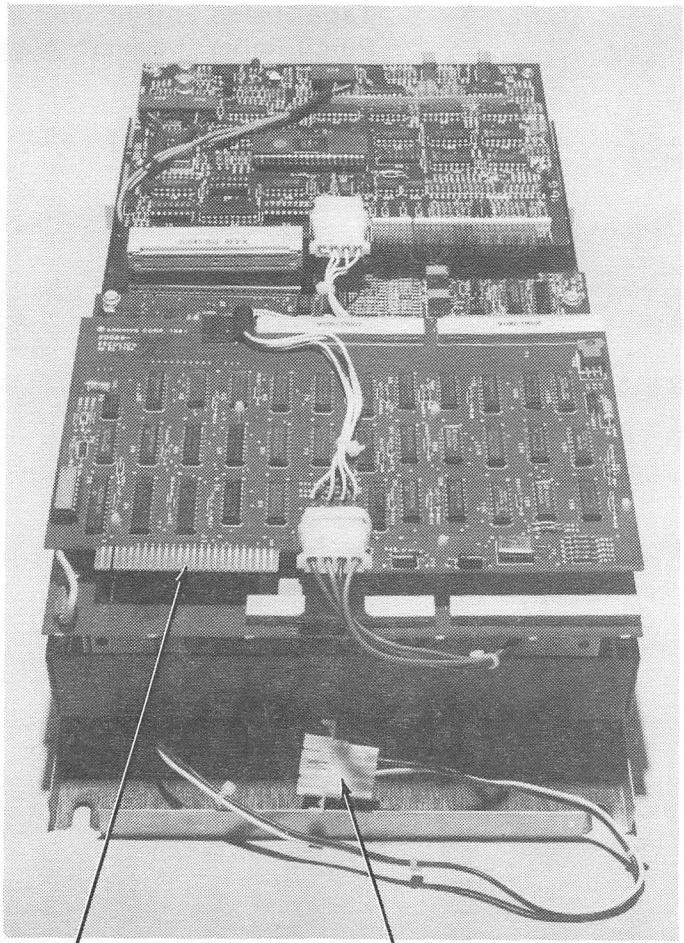
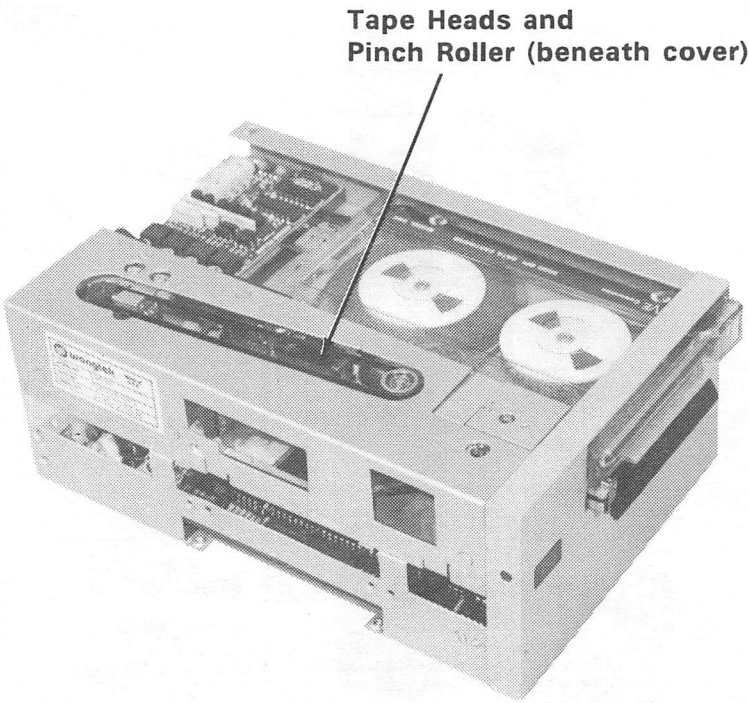


Figure 1-16

Tape Drive Unit
(Desktop File Server)



1.11 Network Interface

User station processors interface to the network via special purpose communications adaptors called Network Interface Cards (NICs). NICs allow interconnecting processors and intelligent peripherals to talk via the network. NICs interface between the network bus and host microcomputer bus. NICs vary according to the type of processor and workstation they serve (Figures 5-1, 5-3, 5-5).

Each NIC in the network has a unique ID (an address from 1 to 255) selected by an address shunt. To address NICs see Appendix D.

The NIC consists of four basic sections:

1. Controller: the network controller IC (called a Resource Interface Module, or RIM) interfaced to 2K bytes of RAM Buffer.

2. Clock: the clock oscillator and clock generator for the controller.

3. Network Interface: the circuitry required to interface the controller to the network (coaxial cable).

4. Processor Interface: the address decoders, bus drivers, etc., required to interface the controller to the system bus of the user station processor.

As explained above, communications on the network are based on a token passing protocol. Network configuration and management of the network protocols are handled for each workstation by the Resource Information Module (RIM) chip.

The RIM contains a microprogrammed sequencer, specialized ALU, and all the logic necessary to control the token passing mechanism and to send and receive data packets at the appropiate time.

The RIM establishes the network configuration, and automatically reconfigures the network as new nodes are added or deleted from the network. The RIM performs address decode, CRC checking and generation on data packets, and packet acknowledgement. The RIM interfaces directly to the host CPU through a standard multiplexed address/data bus contained on the NIC. The RIM functions independently of the host CPU.

An external 2K RAM is partitioned into 4 separate 256 byte buffers and used to hold up to four packets with a maximum length of 508 bytes (data) per packet. The RAM buffer can be accessed by both the processor and the RIM. The RIM provides all signals necessary to allow smooth arbitration of RAM buffer operations. The CPU can also write commands to the RIM and can also read RIM status.

The RIM interfaces to the outside world with the following major components:

1. A Clock Generator

   The clock generator generates the signals used by the RIM to synchronize incoming network data.

2. A Transceiver

   The transceiver converts RIM pulse signals to a format consistent with the transmission media and network topology and converts network signals to the NRZ format required by the RIM.

3. The RAM Buffer

   The RAM buffer is used to hold data packets temporarily prior to transmission on the network, and for temporary storage of all received data packets directed to a particular node. The size of the buffer is 2K byte locations, providing four pages of 512 bytes.

1.12 Power-Supplies

1.12.1 Floor-Standing

There are three kinds of power supply subassemblies in the system.

1.12.1.1 Boschert

The Boschert power supply provides the +5, -5, +12 and -12 DC voltages required to run the card cage and the tape/disk controller PCB (Figure 1-17).

1.12.1.2 Tape Unit

The power supply mounted under the tape unit supplies the +5 and +24 DC voltages required to it.

1.12.1.3 Hard Disk Units

Hard disks (both 8" and 14") have their own power supplies.

The 8" hard disk power supply mounted in the file server cabinet, provides +24, +5, -5 and -12 DC voltages.

The 14" hard disk power supply is self-contained and provides +24, +5, -5, and -12 DC voltages.

1.12.2 Desktop

There is one power supply subassembly in the system (Figure 1-18): It provides:

20 AMP @ +5 volt
8 AMP @ +12 volt
2 AMP @ -5 volt

Pin assignments and power input/outlet positions vary according to power supply model.

1.13 File Server Back Panels

1.13.1 Floor-Standing Back Panel

In older file servers, where internal HUBs are present, the back panel (Figure 1-19) will support up to 3 BNC connector sub-assemblies, each providing 10 external ports to be physically connected to the network. These back panel subassemblies are connected to the internal HUBs by a 50-pin ribbon cable.

All file servers have at least one connector (BNC, fiber optic, or IBM Cabling System) cabled to the file server PIC, which provides the network interface for the file server function.

The back panel also has two RS232 connectors (25-wire 'D' types), labeled "Modem" and "Console".

1.13.2 Desktop Back Panel

The back panel (Figure 1-20) has two RS232 connectors (25-wire 'D' types) labeled "modem" and "console," and a single network connector cabled to the file server PIC, which provides the network interface. The back panel also has a reset button and a cover plate for future external disk connections.

Figure 1-17

Power Supply to
Card Cage, Disk/Tape Controller
(Floor-Standing File Server)

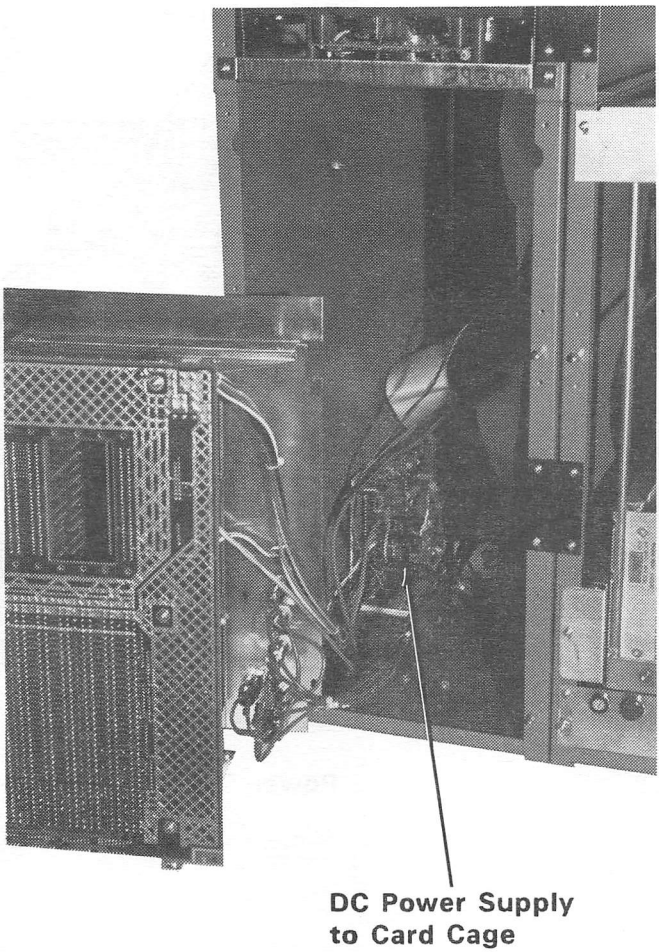


Figure 1-18

Power Supply
(Desktop File Server)

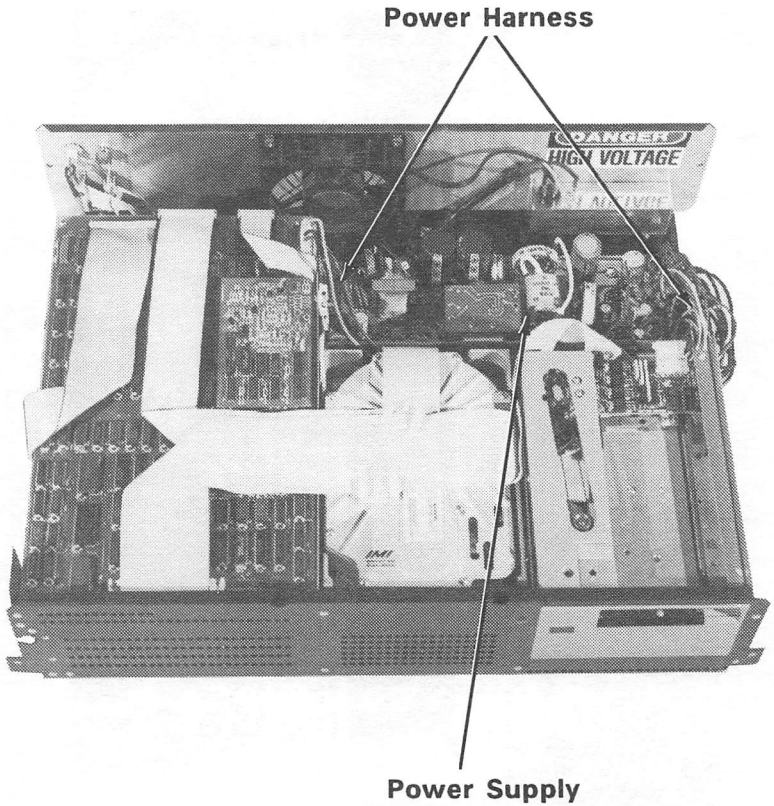


Figure 1-19

Back Panel
(Exterior, Floor-Standing File Server)

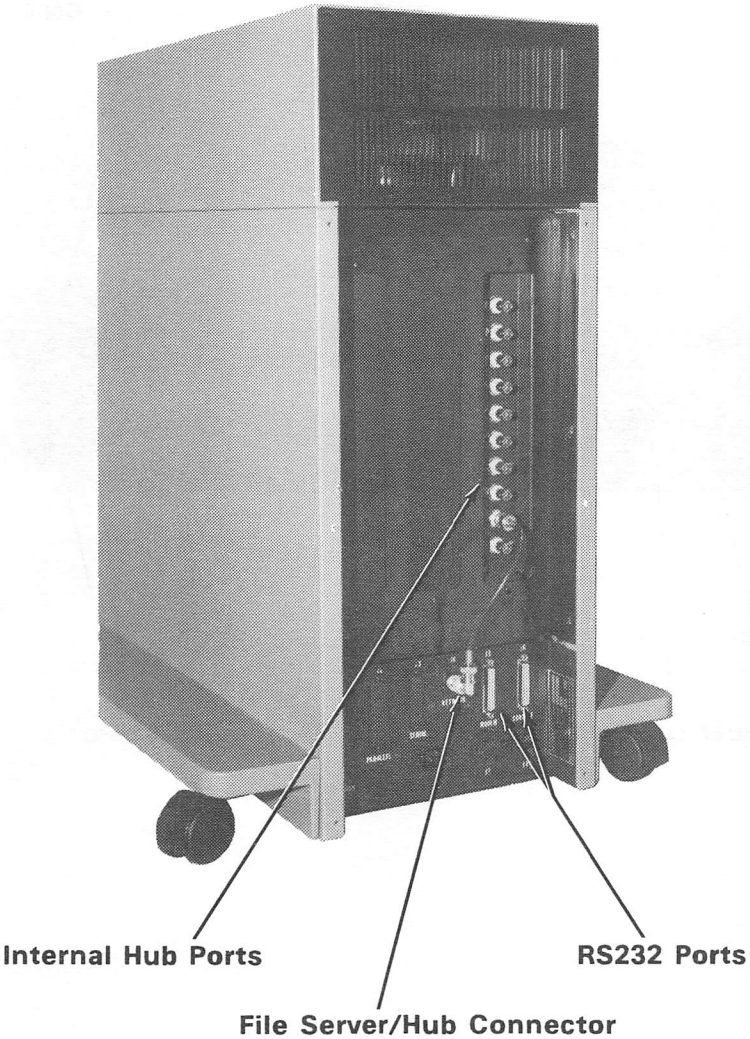
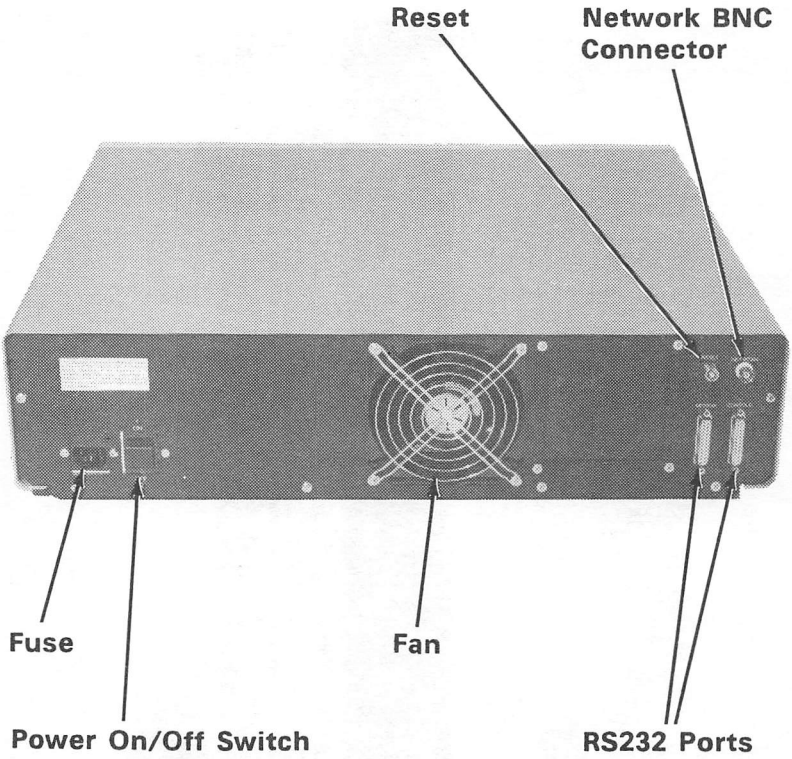


Figure 1-20

Back Panel
(Desktop File Server)



Chapter 2

Preventive Maintenance

With the exception of the file server tape drive, no particular maintenance is necessary for the system. The hardware contains no filters, and the fans are not accessible.

2.1 Server Controller

No preventive maintenance is necessary.

2.2 Hard Disks

The file server 5.25", 8" and 14" disks require no field adjustments or preventive maintenance.

2.3 Tape Cartridges

With proper care, tape cartridges for the backup system have an expected life of 2,000 passes.

Protect the cartridges from excessive heat, magnetic fields, moisture, and dust. Tape cartridges come housed in a protective plastic box and should be kept in this box when not in use. Always remove cartridges from the tape drive when not in use. This allows the plastic cover on the end of the cartridge to swing shut, protecting the magnetic tape from dust.

Note that the system uses 450' 10,000 FCI tape cartridges, which are not the same as DC 300 standard cartridges. DC 300 tapes will not work in the system. Order cartridges through Nestar Systems or another

vendor of quality high-density cartridges.

2.4 Tape Drive

The drive has an integral tape cleaner (a vertical post to the right of the heads) that accumulates tape oxide particles. Read/write head assembly and tape hole sensor assembly should be cleaned regularly with a cotton swab dipped in alcohol (Figures 2-1, 2-2).

New tapes tend to shed oxide particles more than used tapes, so the drive should be cleaned more frequently when new tapes are used. Recommended cleaning intervals are once per eight hours of use with new tapes (more frequently if excessive particles are seen on the tape cleaner), and once per ten hours of use with tapes that have been used for more than 25 backups. "Hours" here refer to time of actual tape motion across the R/W head. Clean the drive after an initial pass with a new cartridge, or every two hours if new cartridges are used exclusively.

Do not use excessive force when cleaning the heads and post.

As you will notice, the opening between the main printed circuit board and the baseplate is very small. It is recommended that when cleaning the R/W head, **power should be turned off** to the unit to avoid possible electrical shock or equipment damage caused by jewelry.

Do not apply cleaner to adjacent parts. Remove all residue completely prior to insertion of media.

The following cleaning solutions and material are recommended for the tape units:

QM 502 - 100 cotton swabs (6 inches long)
QM 505 - 25 foam cleaning swabs (6 inches long)
QM 116 - tape and head cleaner

The following alternatives can be used in place of the above items:

1. cotton swabs - at least 6 inches long to allow access to the R/W head assembly

2. IBM tape head cleaner or isopropyl alcohol

Other cleaning solutions are not currently recommended, since many leave residues on the R/W head assembly, possibly causing a faster build-up of material on the head.

Figure 2-1

Tape Unit
(Floor-Standing File Server)

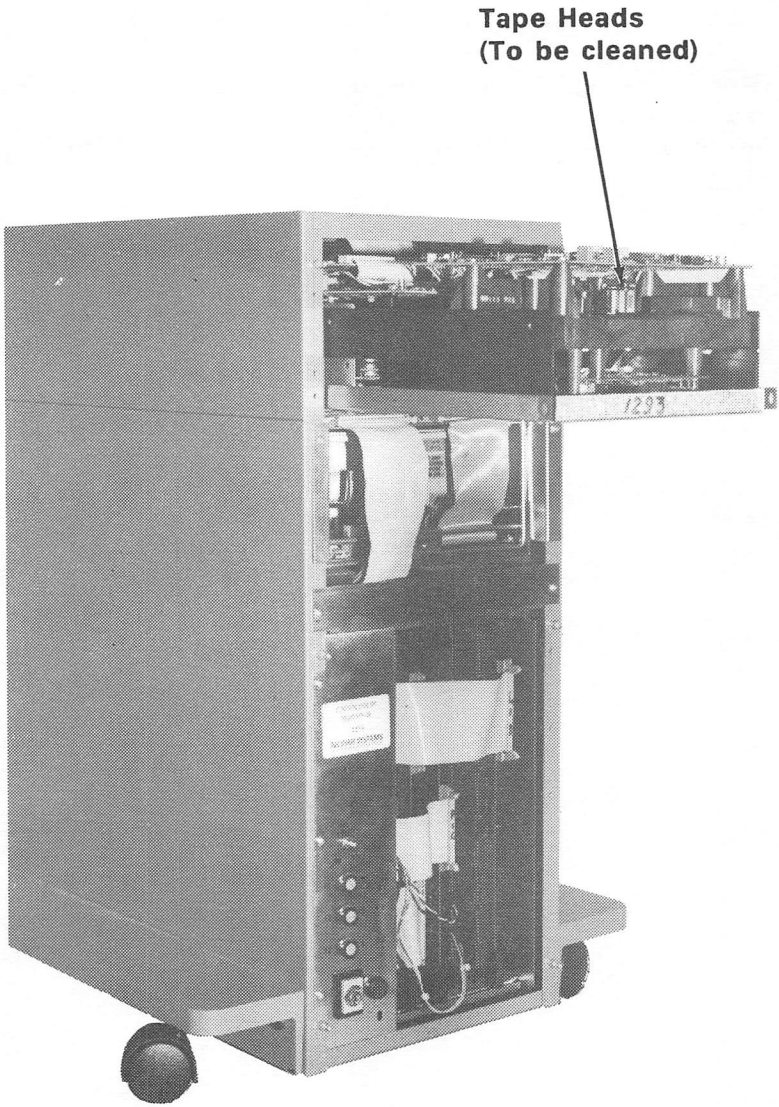
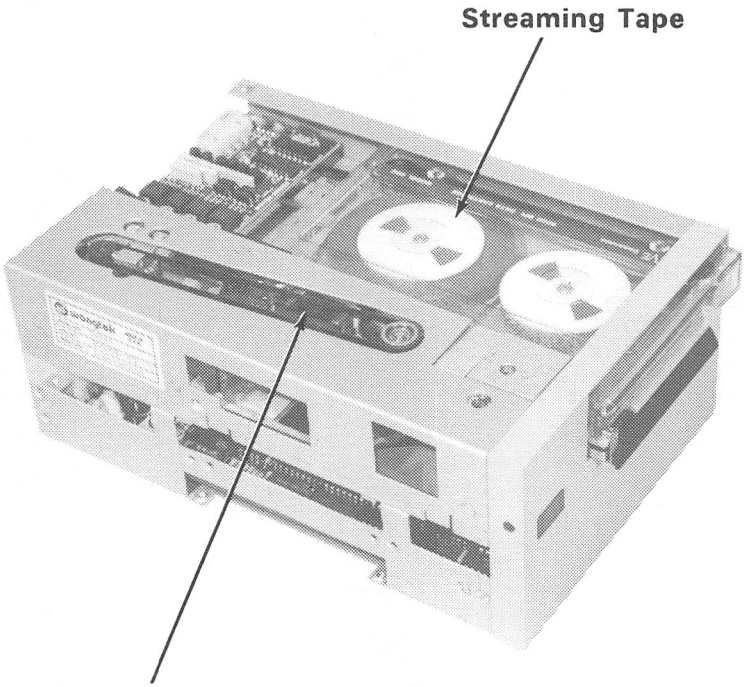


Figure 2-2

Tape Unit
(Desktop File Server)



Chapter 3

Troubleshooting: General Information

The troubleshooting portion of this manual is divided into four chapters:

Chapter 3 General Information

Chapter 4 File Server Hardware

Chapter 5 External Cabling, HUBs, User Workstations, Non-File Server Stations

Chapter 6 Software

This chapter is divided into three Sections:

3.0 Introduction

3.1 Diagnostics

3.2 How to swap a subassembly

Network symptoms are listed in Table 3-1 (page 3-8) and Appendix A.

Hardware error messages and **file-server error and information messages** are listed in Appendix B.

General rules for troubleshooters are found in Section 3.0.4.

The troubleshooting chapters, while emphasizing the need for correct subassembly and software installation and operation, do not duplicate installation and operation information available in other PLAN manuals. Frequent reference will be made to:

PLAN Series System Physical Planning and Installation Manual (GA40-0101)

PLAN File Server Installation and Operation Manual (SC40-0300)

The PLAN Series System Physical Planning Manual will be referred to as "PPM" and the PLAN File Server Installation and Operation Manual as "PIO".

A complete bibliography of PLAN series manuals will be found at the end of this manual.

3.0 Introduction

Network service, as described in this chapter, emphasizes

1. correct cabling, between nodes and within server stations and workstations

2. board-level parts swapping (including software)

3.0.1 Hardware Service

The service representative will have to:

- confirm that all subassemblies have been cabled in correctly

- determine which network subassembly is defective, if any

- correct problems by recabling and swapping parts or assemblies

Consult the network manufacturer when this procedure does not solve the problem.

In most cases the quickest fix will be accomplished by swapping in a new Network Interface Card, Peripheral Interface Card, HUB board or box, disk controller, or other subassembly, as the problem dictates. It is strongly recommended that a service technician bring one of each of these spare parts to the site, so that the troubleshooting process can be performed quickly and easily. Swapping subassemblies is discussed in saction 3.2.

In some cases, the service person may not have a complete set of spare subassemblies at hand, and will need to know whether a symptom points definitely to a particular bad subassembly, so that the subassembly can be returned to the manufacturer for a replacement, with some confidence that the new subassembly will solve the problem.

In many cases, unfortunately, problems in different subassemblies can cause the same symptoms. In these cases, no positive diagnosis can be made and parts swapping is unavoidable. However, whenever possible in this manual, the relative probability of each cause of a symptom is given.

To resolve ambiguities in symptoms, short of physically swapping parts, the service representative should use

1. the symptom list and descriptions in this manual (page 3-8)

2. diagnostic programs available with the file server (Section 3.1)

3. error messages returned by the system (Appendix B)

4. technical support from the manufacturer's service department

5. the service representative's own accumulated experience

As experience with network trouble symptoms and fixes accumulates, and new network diagnostics become available, parts swapping as a diagnostic strategy will play a smaller role.

Network subassemblies to be replaced when faulty:

TERMINAL OR CONSOLE (4.1.2.1)
MODEM (4.1.2.2)
DC POWER HARNESS (3.2.9)
DC POWER SUPPLY (3.2.11, 4.1.3.1)
MOTHERBOARD (FILE SERVER) (4.1.3)
FILE SERVER INTERNAL CABLES (3.2.3, 4.2.3.2)
WIRING (3.2.4)
DISK (3.2.8, 4.2.3.3)
PIC (3.2.6, 4.2.3.4)
DISK/TAPE CONTROLLER (3.2.7, 4.2.3.5)
CPU (3.2.6, 4.1.2.3, 4.2.3.6)
TAPE DRIVE (3.2.10, 4.4.1)
CLOCK/CALENDAR (PART OF PIC) (4.4.2)
FUSES (3.2.5)
FAN (3.2.12)
EXTERNAL CABLING (5.1.1)
HUB (3.2.1, 3.2.2, 3.2.6, 5.1.2)
WORKSTATION COMPUTER (3.2.13, 5.2.6)
NIC (USER STATION) (5.2.6)
80-COLUMN CARD (USER OR NON-FILE SERVER STATION) (5.2.6)
MOTHERBOARD (USER STATION) (5.2.6)
SOFTWARE (CHAPTER 6)

3.0.2 Software Service

The service representative should determine, when possible, whether the problem is in the system hardware or system software (Section 3.0.3).

In the case of system hardware problems, the representative should correct the problem. In the case of system software problems, the representative should

contact the network manufacturer. Problems with applications software should be handled by the applications software vendor or dealer.

3.0.3 Hardware or Software Problem?

3.0.3.1 Hardware Indicators

1. The file server won't power up
2. No disk or tape will boot
3. File server boots and functions normally, but can't talk to other stations
4. A functioning, proven system suddenly slows down or hangs
5. The network runs too slowly

3.0.3.2 Software Indicators

1. File server software will not execute the first time; older version will run
2. An application program hangs the user station or file server

3.0.3.3 Ambiguous Indicators

1. File server will not boot from a disk, but will boot from tape, or vice versa
2. File server suddenly hangs or slows down; network activity suddenly decreases

3.0.4 General Rules For Troubleshooters

1. Always confirm first that **file server, console, HUB, and user station power cords are plugged in,** and that the cords have not been loosened or partially unplugged.

   However, always **unplug** all cords before servicing a system.

2. For file server software releases earlier than Release 2.2, always confirm that no one has **accidently pressed a key on the file server console or terminal,** causing the file server to suspend all network activity and wait for a console command. Press <Return> to check for this frozen condition and to free up the file server.

3. For floor-standing file servers, confirm that **any hard disk locks present have been unlocked,** when present (PPM, 3.2.3).

4. Notice environmental factors: network equipment should be located where

    a. temperatures are in the range 10-35 C
    b. relative humidity is in the range 20-80%
    c. electromagnetic radiation is not present
    d. network cables will not be flexed, run over by heavy carts, or otherwise stressed
    e. vibration is minimized
    f. power surges are absent

5. When diagnosing file server problems, the **file server should be isolated from the network:** disconnect the network cable from the file server connector at the rear of the cabinet, or, for floor-standing file servers with internal HUBs, disconnect the short external HUBs until the file server is up and running correctly.

6. An exception to rule #4 occurs when the **file server hangs during operation** (Section 4.3.2). In some such cases, user stations and HUBs should be disconnected one at a time from the network, to determine if a particular station or HUB is causing network operations to freeze.

7. When the network seems to be **running too slowly,** check first that none of the external cabling rules (Section 5.1.1) have been violated.

Check second for a bad HUB or a bad port on a HUB (Section 5.1.2).

8. A **system error message** will often direct you to the problem component. See Appendix B.

9. Since the PLAN Series networks are token-passing, one family of network problems relates to difficulties in passing the token and the effect on **network reconfigurations** (recons) that such difficulties cause. Recon symptoms are discussed in Section 5.1.2. and in other Sections that treat the symptom NETWORK RUNS TOO SLOWLY.

10. Although **HUB and NIC LED lights** are not easy to use for diagnostic purposes (and are not present on all HUBs), some things can be learned from their activity. See Section 5.1.2.

11. Two types of LEDs exist, sometimes mixed in one HUB. The viewing angle is different for the two types. One type glows brightly and is easily seen to be lit from above. The other type glows only within, and cannot be seen to be lit from above or below. Always **check LEDs by looking directly into them,** even if some are easily seen to be lit.

12. A bad PIC can cause persistent, varied problems, apparently unrelated, such as corrupted virtual volumes, data errors at user stations, and fatal tape dump errors.

13. Widely varied symptoms can also be caused by incorrect versions and mismatches of firmware for the disk/tape controller and tape drive. Contact your Nestar service representative for correct Rev levels and Rom-vs-tape drive matches.

    For PLAN 3000:

    For System Release 4 software, the disk/tape controller board must have ROM level D.

For PLAN 4000:

For System Release 4 software, the disk/tape controller board must have ROM level K.

When troubleshooting, always record all error messages and the exact sequence of events, in case the network manufacturer's technical support staff is later involved.

Table 3-1

NETWORK SYMPTOMS

Some symptoms appear more than once in this list.

File Server Will Not Power Up

F1	NO POWER LIGHT; NO CONSOLE OR USER STATION DISPLAY	4.1.1
F2	POWER LIGHT ON; NO CONSOLE DISPLAY, USER STATION DISPLAY PRESENT	4.1.2
F3	POWER LIGHT ON; NO CONSOLE DISPLAY; NO USER STATION DISPLAY	4.1.3

File Server Software Will Not Execute

F4	BOOT MENU APPEARS; DEFAULT DISK WILL NOT BOOT; BOOT FROM ANOTHER DISK OR FROM TAPE IS SUCCESSFUL: PROBABLE CPU OR DISK PROBLEM (SEE ALSO N1)	4.2.1
F5	BOOT MENU APPEARS; NO DISK WILL BOOT; BOOT FROM TAPE SUCCESSFUL: PROBABLE DISK OR DISK CONTROLLER PROBLEM (SEE ALSO N1)	4.2.2
F6	BOOT MENU APPEARS; NO DISK OR TAPE WILL BOOT: PROBABLE CABLE, DISK, DISK CONTROLLER, OR PIC PROBLEM (SEE ALSO N1)	4.2.3

File Server Slows, Hangs, Crashes, or Won't Talk to Other Network Stations

F7	FILE SERVER OPERATES, BUT CAN'T TALK TO USER OR OTHER SERVER STATIONS (SEE ALSO U4)	4.3.1
F8	FILE SERVER HANGS DURING OPERATION (SEE ALSO H1, U1, N5)	4.3.2
F9	FILE SERVER CRASHES DURING OPERATION	4.3.3

Other Errors in File Server Operation

Network Hangs or Slows During Operation (HUB and External Coax Cabling Problems)

User and Server Station Problems (Servers Other than File Servers)

Network Software Problems

(Non-File) Server Software Problems

Application Program Problems

3.1 Diagnostics

A set of file server utilities is provided with the file server. These are used for maintenance of the file system and file server resources, and diagnosis of network problems.

These utilities run on the file server, via the file server console or terminal, and are located on the virtual volume /MAIN/SYSTEM/FILESERVER. They cannot be run while other file server operations are in progress.

Online network utilities, which are run from user stations while the file server is in operation, are described in the file server user guides. (See the Bibliography at the end of this manual). These utilities include a reconfiguration counting program and programs to delete trees and subtrees of network files, and to copy files from one workstation environment to another. Other IBM PC network test features are described in Section 5.2.6.3.

The CARDCHK utility programs for the Apple and the IBM PC NICs are described in the CARDCHK manuals (see Bibliography). CARDCHK tests for and diagnoses problems on the NIC.

To use a utility, power on the file server. The file server network software waits 5 seconds before attempting to boot from the first disk drive. Press <Esc> and the boot menu will appear:

Boot Menu

T - Boot from tape drive
1 - Boot from drive 1
2 - Boot from drive 2
3 - Boot from drive 3
4 - Boot from drive 4

This menu will also appear if an error is encountered during the subsequent boot process.

Select the unit from which you wish to boot. If no key has been pressed and no error encountered, (default) disk number will boot automatically. (You will use utilities from tape or from a disk other than the boot disk when, for example, the default boot disk is to be examined for damaged areas.)

The file server now waits 10 seconds before executing the file server software. To use a utility, type <ESC> during this waiting period. A menu of utilities will come up on the screen.

If the file server software is already running, type

[<Esc><password><Return>]QUIT<Return>

to quit the program, and the utility menu will come up (brackets indicate optional password has been set).

In either case, a menu of utilities will appear:

File Server Utility Menu

a. file server
b. partial tape dump/restore
c. full tape dump/restore
d. copy partial disk to disk
e. copy full disk to disk
f. power down disk drive(s)
g. list disk contents
h. examine/modify disk contents
i. check/repair disk consistency
j. format disk
k. add or modify tape dump instruction files
l. modem on/off/setup

Make your selection by typing the appropriate letter, followed by <Return>.

a. FILE SERVER causes the file server software to execute.

b. PARTIAL TAPE DUMP/RESTORE copies selected hard disk files to and from backup tape cartridges.

c. FULL TAPE DUMP/RESTORE copies all the files on a hard disk onto backup tape cartridges, or restores all copied files from tape to disk.

d. COPY PARTIAL DISK TO DISK copies data from one disk location to another. Structural changes in the file server hierarchy can be accomplished using this utility.

e. COPY FULL DISK TO DISK copies entire volumes of data between media that are of identical size.

f. POWER DOWN DISK DRIVE(S) sequences down hard disks prior to turning off the disks.

g. LIST DISK CONTENTS creates a directory list of some or all of the disks attached to a file server.

h. EXAMINE/MODIFY DISK CONTENTS is used for a variety of disk maintenance and diagnostic purposes.

i. CHECK/REPAIR DISK CONSISTENCY verifies and manipulates the state of file server hard disks.

j. FORMAT DISK initializes disks for use with the file server. Hard disks are shipped already formatted, and should not be reformatted except under special circumstances.

k. ADD OR MODIFY TAPE DUMP INSTRUCTION FILES allows you to predefine Partial Tape Dump/Restore operations (used in option b)

l. MODEM ON/OFF/SETUP allows you to use a modem and remote console, for file server diagnostics via telephone.

Use of these utilities is described in PIO (Chapter 4).

3.2 How to Swap a Subassembly

Warning:

1. When reconnecting ribbon cables, confirm that the red stripe on the cable is matched to pin 1 in the connector.
2. When sliding units out of floor-standing cabinets, take care not to bump board jumpers against cabinet edges.
3. Lock disks before moving them.

3.2.1 Removing File Server Panels and Covers

Floor-Standing Back Panel

Unscrew six screws (Figure 1-19).

Floor-Standing Front Panel

Pop the cover off.

Desktop

1. Remove rear screws (Figure 1-20).
2. Slide cover forward and off, being careful not to snag or rip cables.

3.2.2 Internal HUB Rear Port Panel

1. Disconnect all BNC connector/cables.
2. Unscrew two screws
3. Disconnect Peripheral HUB Board 50-pin cable (Figure 3-3).

3.2.3 Cabling

For all ribbon cable, insure that the red stripe on the edge of the cable is matched to pin 1 on the connector.

3.2.3.1 Internal File Server Cabling (Floor-Standing Model)

Connections between cards (boards) in server and server back panel (Figures 3-1, 3-2 and 3-7):

LOGIC

a. CPU card - one 50-pin ribbon cable, going to 2 RS232 ports on back panel (cable is split in rear)
b. PIC card - twisted-pair cable to back panel network connector
c. PIC card - connection to reset button on front of server box
d. PIC card - cable to the disk/tape controller
e. each HUB card - 50-pin ribbon cable to one of the BNC Peripheral HUB Boards that form part of back panel (Figure 3-3)
f. if multiple HUB cards are present, HUB cards are "jumpered" together by a twisted pair connection from one HUB card to the physically adjacent HUB card
g. cable from disk/tape controller on the side of the cabinet to tape drive
h. cable from disk/tape controller to first disk

DC CONNECTORS

a. connection of 8" hard disk drive to disk power supply (tape drive and 14" hard disk have built-in power supplies)
b. connection of card cage to multibus cage power

supply (N.B.: a. and b. are separate supplies)
c. connection of power supply to tape disk controller
Caution: this connection must be made as shown in Figure 3-5

AC CONNECTIONS

a. one cord from unit power socket to wall outlet
b. connections of multibus cage power supply to AC power
c. connection of fan to AC power
d. connection of AC power to 14" or 8" hard disk power supply
e. connection of tape subassembly to AC power

Each file server cabinet has a slot at the bottom back of each side panel. When casters are attached, the slots are invisible. If cabinets are joined, the slots provide access from one cabinet to the next. Cables need not be routed out the back of one cabinet and into the back of the other. Instead, cables are run from the file server cabinet to the proper locations in the first storage cabinet, if present.

If cabinets are not bracketed together, the slots are not used, and the cabinets are connected via a ribbon cable that plugs into the rear "aux disk" port of adjacent cabinets.

The "serial" and "parallel" ports on the rear of the file server cabinet are reserved for future expansion.

Power supply voltage information is found in Section 4.1.3.1.1

Figure 3-1

Signal Cables (Floor-Standing Models)

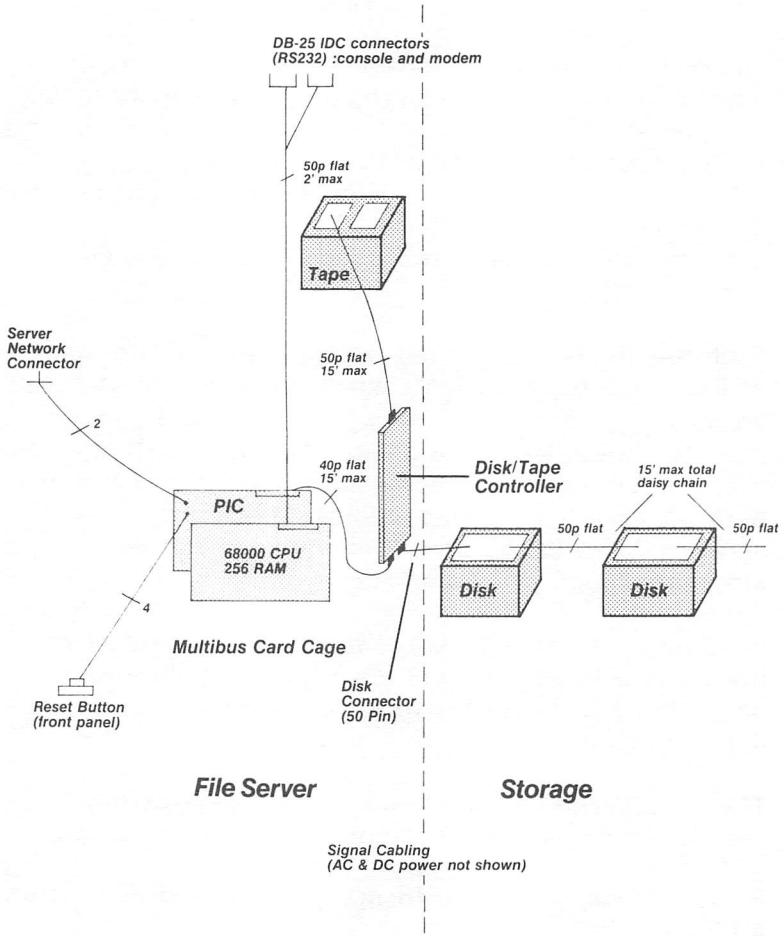


Figure 3-2

Card Cage
(Floor-Standing Model)

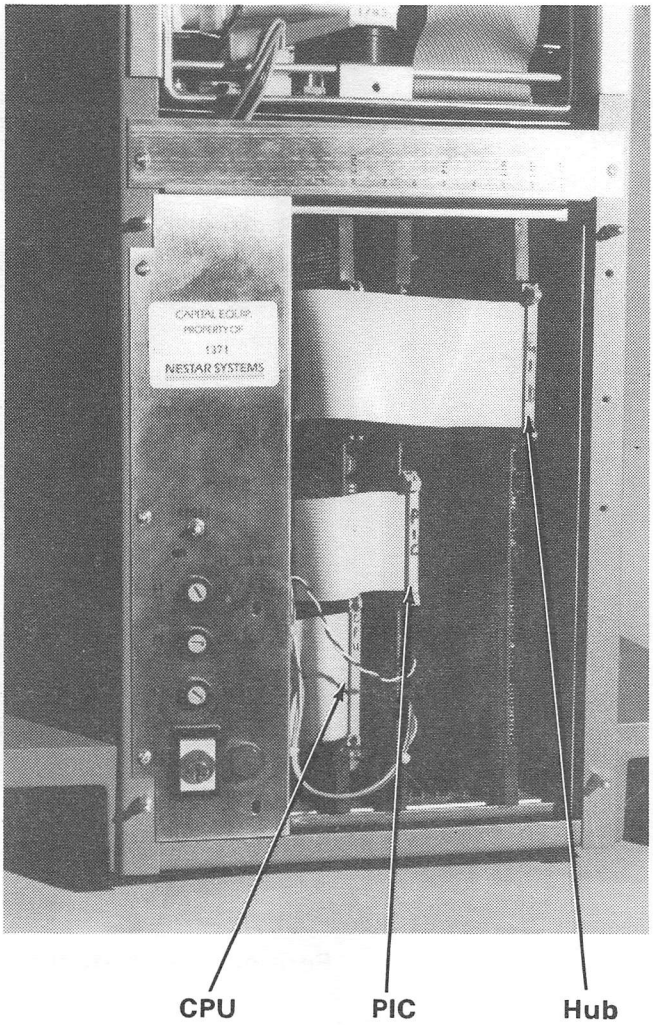
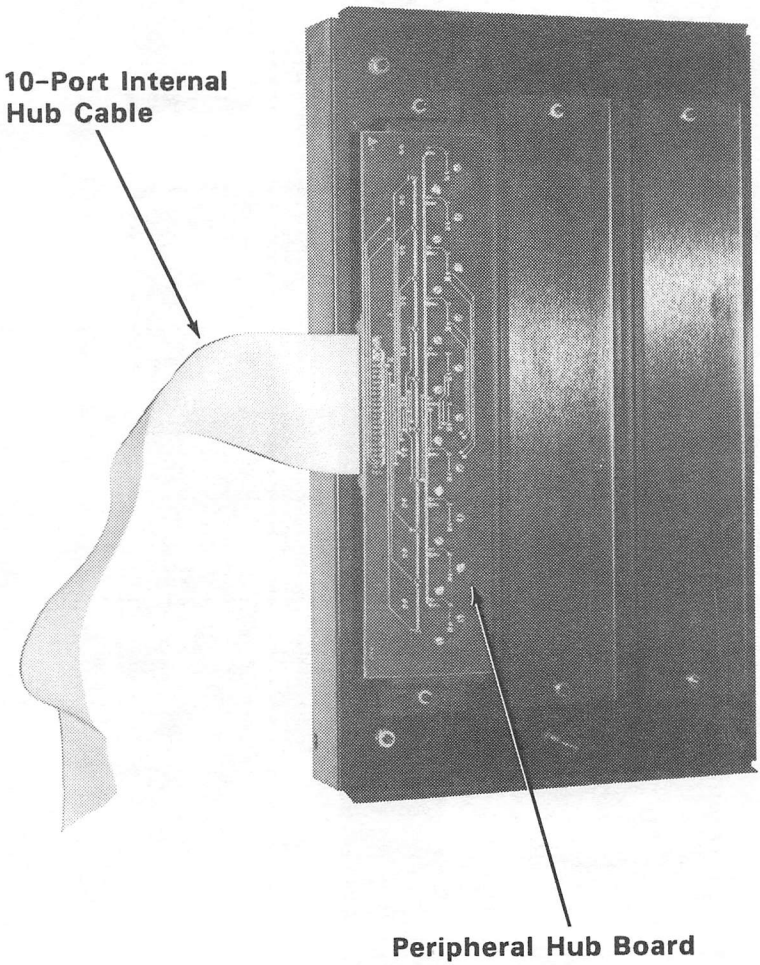


Figure 3-3

Peripheral HUB Port
Rear Panel
(Floor-Standing Model)



3.2.3.1.1 Floor Standing File Server Internal Cabling Checklist

The checklist requires access to both front and back of the cabinets. There should be 3-4 feet of space in front of and behind the cabinets to make the checkout easier.

Checklist:

1. Make sure that no power cords are plugged in.

2. Remove the front panel from the file server cabinet.

3. Inspect all physical connections visible from the front of the box:

   a. 50-pin cable from CPU board
   b. one twisted pair cable from PIC board
   c. one 50-pin flat cable from each HUB board
   d. one 40-pin cable from PIC card to disk/tape controller
   e. 4-wire cable from PIC to front panel (Reset)
   f. 15-pin DC connector to backplane (visible only when card cage has been removed)

   All these cables should be connected to the specified board in the card cage. The cables should all extend to the left or right side of the card cage or backplane where cut-out sections allow them to be positioned so that they can wrap around the card cage to the back panel.

4. Make sure that all boards in the card cage are firmly seated: pull out first, then reseat them by pushing them toward the back of the card cage.

BOARD	SLOT
PIC	5
CPU	8
HUBs	1,2,3

5. Replace the front panel.

6. Remove the exterior back panel of the file server cabinet. The BNC Peripheral HUB Board and a rear view of the cabinet is shown in Figure 3-3. The boards are fiberglass, with ten BNC connectors each, with a metal panel included in the assembly.

7. Inspect all physical connections visible from the back of the file server cabinet. The connections are:

   a. The cable from the CPU card to the two RS232 ports on the back panel (Figure 4-1)
   b. The 50 pin cable from each HUB board in the card cage to one of the network BNC panels, if present
   c. The twisted pair cable from the PIC board to the bottom network connector on the back panel (not part of the BNC board)
   d. Two disk/tape controllert cables: one to disk and one to tape.

8. If a hard disk is present in this cabinet, make sure that the cable from the disk/tape interface on the PIC is plugged into the controller residing on the side of the cabinet. Also make sure that the cable from the tape drive plugs into the disk/tape controller and that the cable from the disk plugs into the disk/tape controller.

When more than one 50-pin cable connector have been attached, both the male and female halves of the connectors are clearly, identically marked, to prevent incorrect cabling.

3.2.3.2 Internal File Server Cabling (Desktop)

Connections between cards (boards) in server and server backpanel (Figures 3-4, 3-5):

LOGIC

a. CPU card - one 50-pin ribbon cable, going to 2 RS232 ports on backpanel (cable is split in rear). The CPU card is located below the PIC card in the card cage (Figure 4-2)
b. PIC card - twisted pair cable to backpanel network connector
c. PIC card - connection to reset button on back of server cabinet
d. PIC card - cable to the disk/tape controller
e. cable from disk/tape controller to tape drive
f. cable from disk/tape controller to 5.25" disk

DC CONNECTORS

a. connection of 5.25" hard disk drive to power supply
b. connection of tape drive to power supply
c. connection of tape formatter to power supply
d. connection of card cage to power supply
e. connection of disk/tape controller to power supply

AC CONNECTIONS

a. one cord from power socket to wall outlet
b. connections of power supply to AC power
c. connection of fan to AC power

Power supply voltage information is found in Section 4.1.3.1.2

Figure 3-4

Signal and Power Cabling (Desktop)

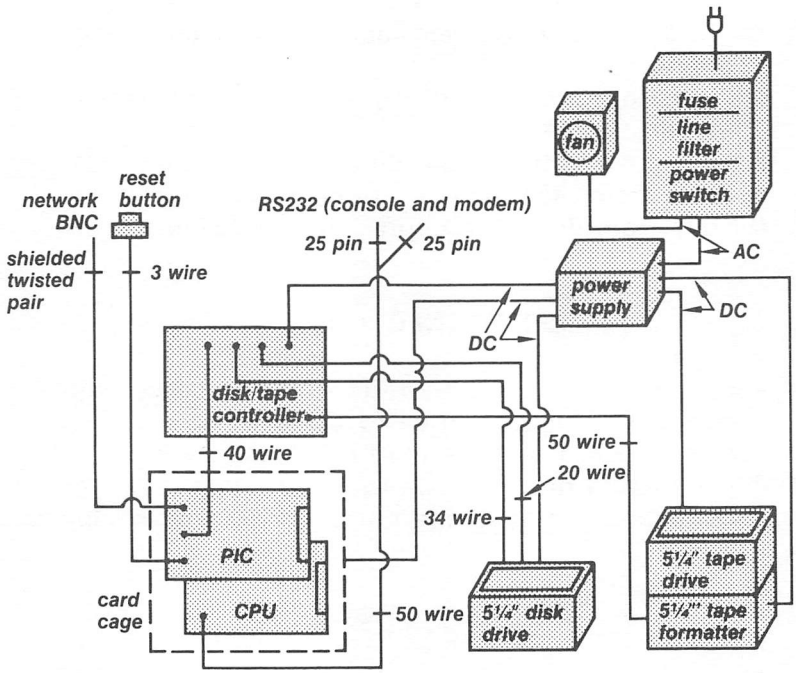
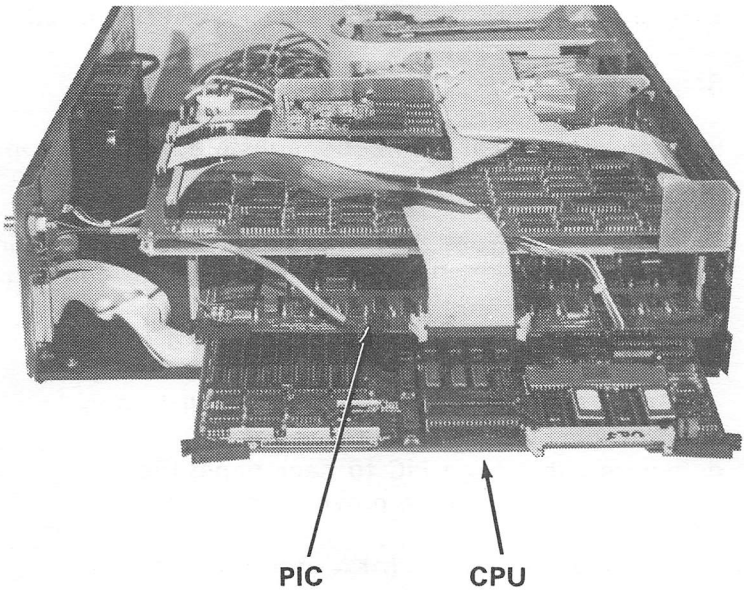


Figure 3–5

Card Cage with CPU Pulled Out (Desktop)



3.2.3.2.1 Desktop Cabling Checklist

Checklist:

1. Make sure that no power cords are plugged in.

2. External cable should be disconnected from the network connector while the file server is checked.

3. Remove the file server's cover.

4. Inspect all physical connections visible from the top of the box:

   a. 50-pin cable from CPU board split into two 25-pin cables to the RS232 modem and console connectors on the back panel
   b. one twisted pair cable from PIC board to the network connector on the back panel
   c. one 40-pin cable from PIC card to disk/tape controller
   d. 3-wire cable from PIC to back panel (Reset)
   e. DC harness connects power supply to:

      card cage backplane (AKA motherboard)
      disk/tape controller
      disk
      tape
      tape formatter

   f. cable from tape drive to tape formatter in the same tape unit
   g. two cables (20 pin and 34-pin) from disk/tape controller to disk.
   h. 50-pin cable from disk/tape connector to tape.

   All of these cables should be connected to the specified board in the card cage.

5. Examine the boards in the card cage to assure that all are firmly seated; if any are not, push them

toward the back of the card cage until they are. The PIC and CPU boards can reside in any slot; however, in most cases, slots will be labeled for each.

BOARD	SLOT
PI	3
CPU	1

6. Make sure that the cables from the disk/tape interface on the PIC are plugged into the controller residing on the top of the card cage. Make sure that the cable from the tape drive and the disk plug into the appropriate connectors on the disk/tape controller.

3.2.4 Wiring

Wiring Color Code

Products manufactured by Nestar Systems will adhere to the following wiring color code:

AC	Color	Description
	Brown	Hot
	Light Blue	Neutral
	Green/Yellow	Grounding
DC	Red	+ 5 V
	Orange	+12 V
	White	- 5 V
	Violet	-12 V
	Black	Common (Except 24 V)
	Yellow	+24 V
	Grey	24 V Common

Wire styles used in Nestar Products will adhere to the following.

UL Style	CSA Type	Description
1007	TR-64	300 V, 80 C,.015"
1015	TEW-300	600 V, 105 C,.030"
1429	XLPVC	150 V, 80 C,.010"
1430	REW(XLPVC)	300 V, 105 C,.015"

3.2.5 Changing a Fuse

Fuses

Location	Label	Amps (115 V)	Amps (230 V)
Line filter/ switch receptacle (Desktop rear)	none	3.125	3.125
Front panel (Floor-standing cabinet labeled "File Server")	F1	10	5
	F2	10	5
	F3	5	3
Front panel (Floor-standing cabinet labeled "Storage")	none	5	2.5

3.2.6 CPU, PIC, Internal HUB

Floor-Standing Model

1. Remove front panel of the cabinet labeled "File Server."
2. Detach cables from board (Figure 3-2).

3. Pull out board.
4. When inserting new board, press in firmly, to insure that the board is seated correctly.

Desktop

1. Remove cabinet cover.
2. Detach cables from board (Figure 3-5).
3. Pull out board.
4. When inserting new board, press in firmly, to insure that the board is seated correctly.

3.2.6.1 CPU Jumpers

The 68000 card resides in a Multibus card frame that can use various schemes to implement Bus priority (required for systems where more than one card can be a bus master). The PLAN 4000 has a 9-slot backplane that has active circuitry for allocating the bus master, using the parallel priority technique. The PLAN 3000, on the other hand, has only 4 slots and uses the serial priority technique. This simplifies the PLAN 3000 backplane design.

As a result of this and to avoid restrictions on the placement of CPU cards in the PLAN 3000, a CPU card to be used in a PLAN 3000 must have a jumper placed on the card which is not present on the PLAN 4000 card. Should this jumper be left off, the card will not function unless it is in the "highest" slot in the back plane (i.e., the top slot).

Changing From Old To New CPU

PLAN 4000: no changes, all cards remain exactly as they have been.

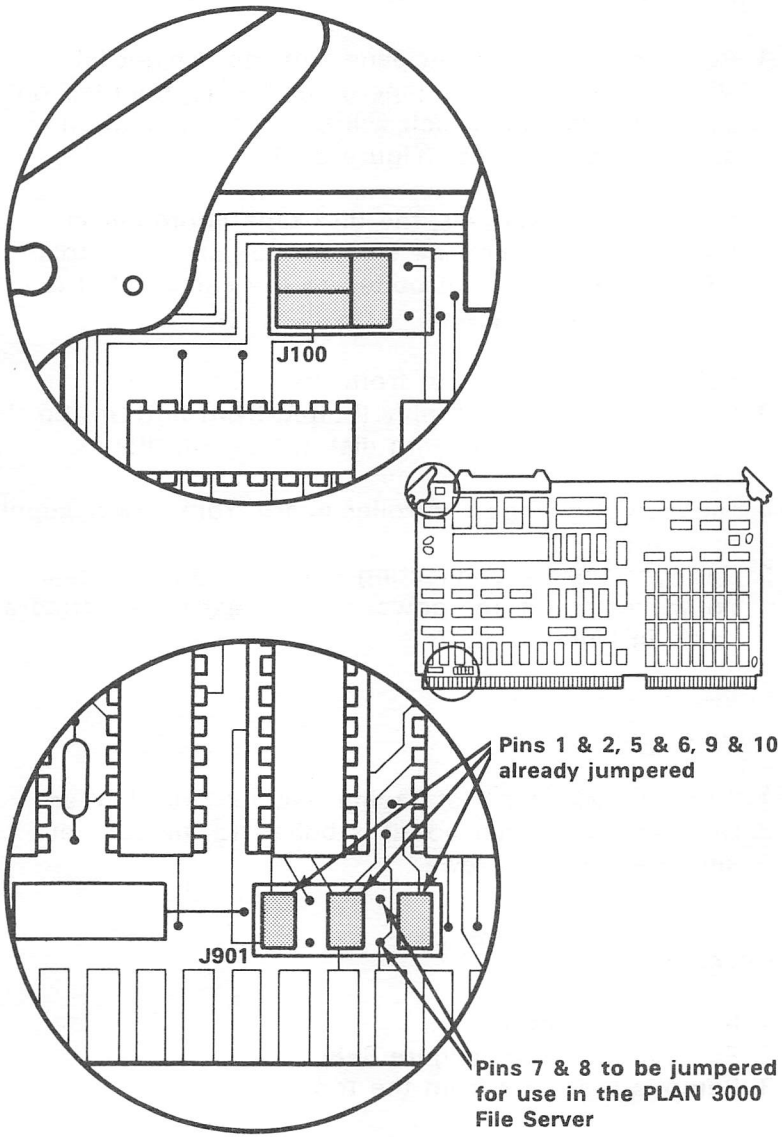
PLAN 3000: jumper must be inserted in J901 between pins 7 & 8 (pins 1 & 2, 5 & 6, and 9 & 10 are already jumpered).

To locate J901, hold the board, components up, with edge connectors towards you. J901 is now in the lower left corner, adjacent to the 28-pin socketed IC, and the gold plated fingers of the edge connector.

Pins 7 & 8 are the second set of contacts from the right of J901; as shown in Figure 3-6.

Figure 3-6

PLAN 3000 CPU Added Jumper



3.2.7 Disk/Tape Controller

Floor-Standing

Single Unit

1. Remove back and front panels of the cabinet labeled "File Server." The disk/tape controller is mounted on the power supply, which will be on the left when looking from the rear (Figure 3-7).

   In some older models, the disk/tape controller is located on the opposite side of the cabinet. In this case, the board is not bolted to the cabinet, but is secured with standoffs.

2. Pull the 60 MB disk out from the front.
3. Remove the power supply (bolted from bottom; tip the file server to do so), with disk/tape controller screwed to it.
4. Unscrew disk/tape controller board from power supply (6 screws).
5. Caution: when reconnecting power to the disk/tape controller board, the power cable must be attached as show in Figure 3-9.

Double Unit

1. Remove back panel of cabinet labeled "File Server."
2. Disk/tape controller board is bolted to the cabinet side. Remove 6 screws.

Desktop

1. Remove the top cover.
2. Remove all cables (Figure 3-8).
3. Remove 5 screws from the top.

Figure 3-7

Disk/Tape Controller
(Floor-Standing Model, Rear View)

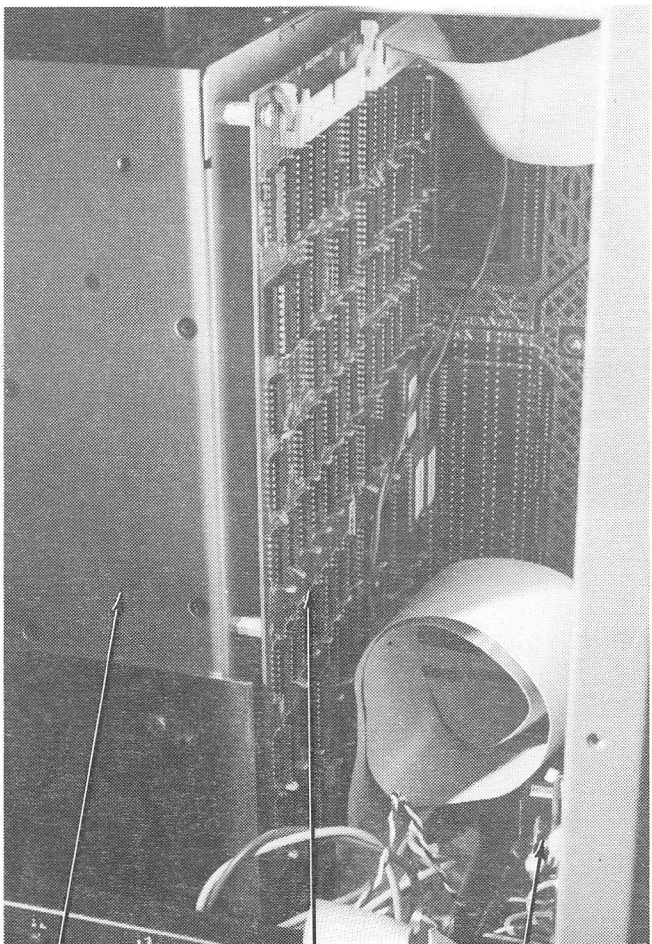


Figure 3-8

Cabling and Disk/Tape Controller (Desktop)

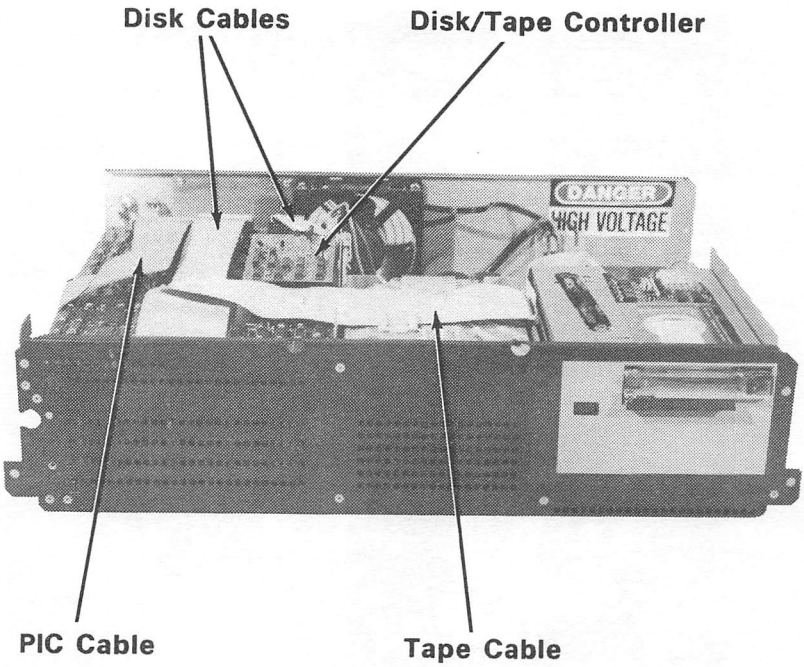
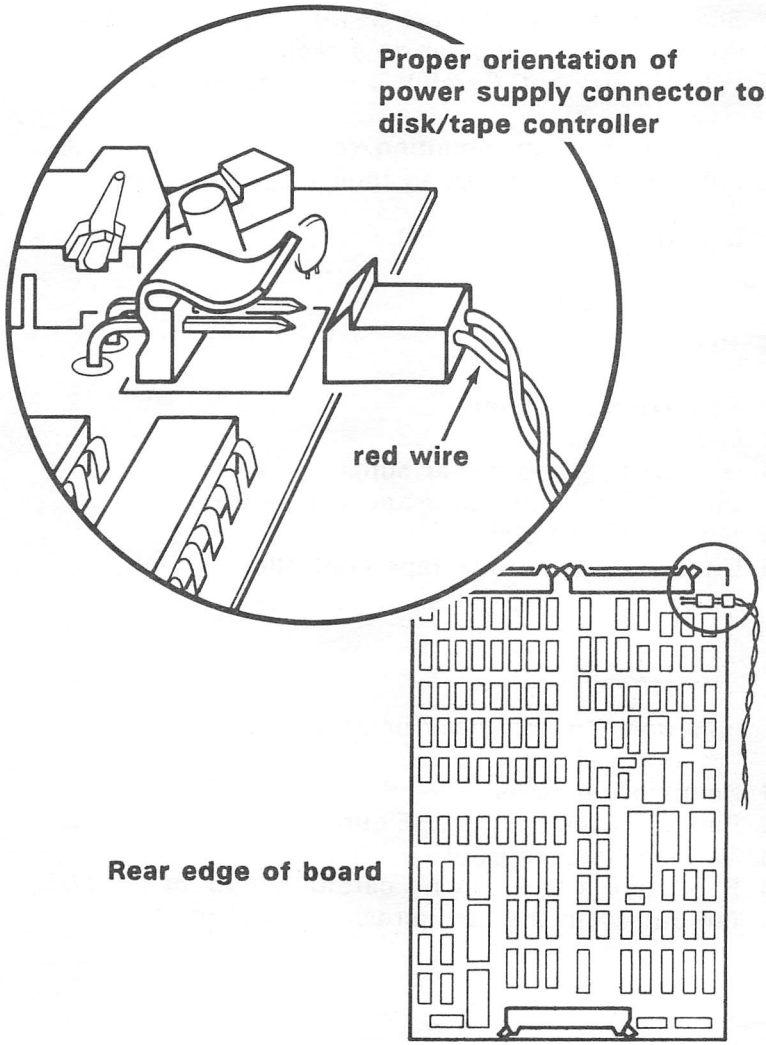


Figure 3-9

Power to Disk/Tape Cabling



3.2.8 Replacing Hard Disks

14" Hard Disk

Warning: Unstable when tipped.

1. Lock the disk (Figures 3-10, 3-11, 3-12).
2. Slide out the disk (Figure 3-13).
3. Put the storage cabinet on a table.
4. Pull the disk out. Careful: it will tend to fall over.
5. Remove the four mounting screws under the disk.
6. Pull off all cables, noting their location (Figure 3-14).
7. Pull off the disk.

8" Hard Disk

1. Remove front cover.
2. Lock the disk.
3. Unhook cable to power supply.
4. Unscrew 2 screws on front of the disk tray.
5. Slide out hard disk.
6. Unhook cable to disk tape controller.

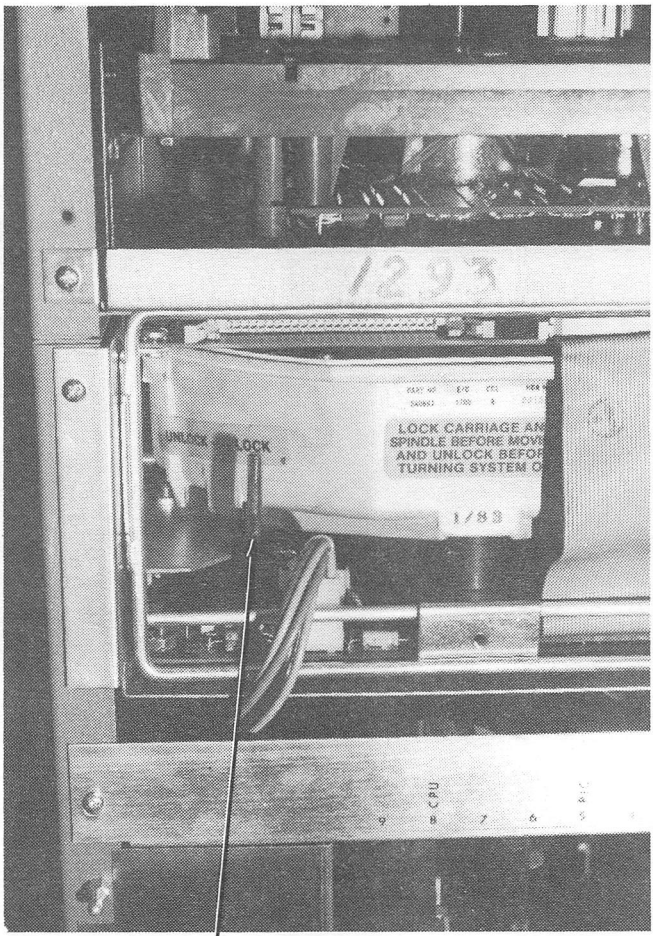
5.25" Hard Disk

Fragile unit. Do not shake or drop.

1. Remove top cover.
2. Remove cables to disk (Figure 3-15).
3. Tip unit onto its front.
4. Remove 4 screws, being careful not to let the disk fall out when the last screw is removed.

Figure 3-10

14" Hard Disk Head Lock (2-lock model)



Head Lock

Figure 3-11

14" Hard Disk Spindle Lock (2-lock model)

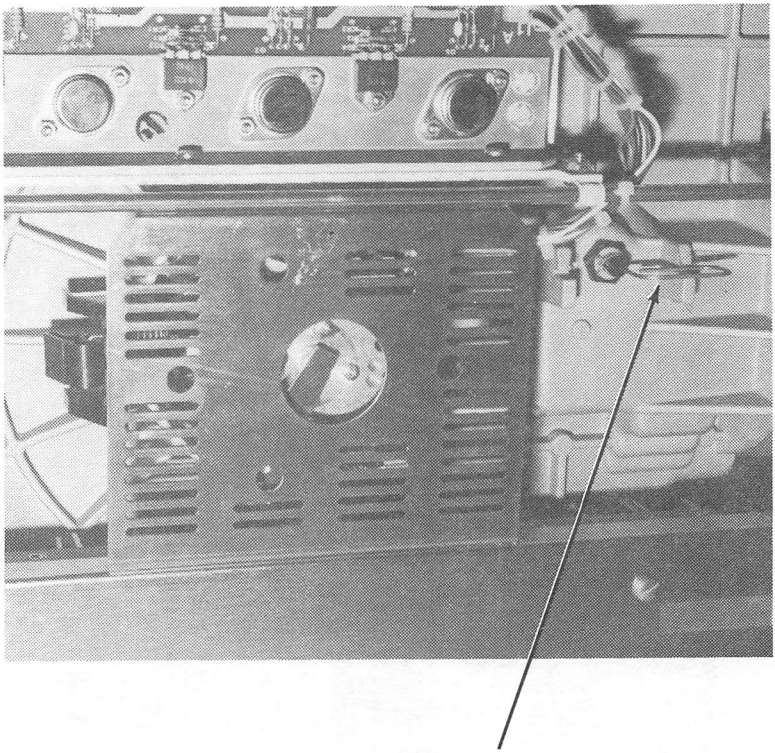


Figure 3-12a

Unlocking Hard Disks (two lock model)

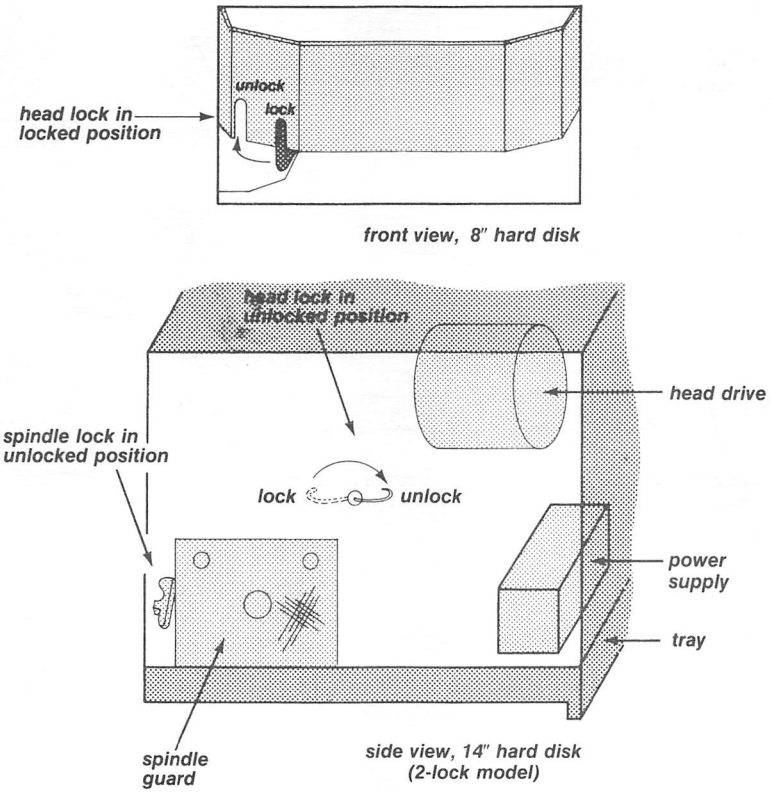


Figure 3-12b

Unlocking Hard Disks (one lock model)

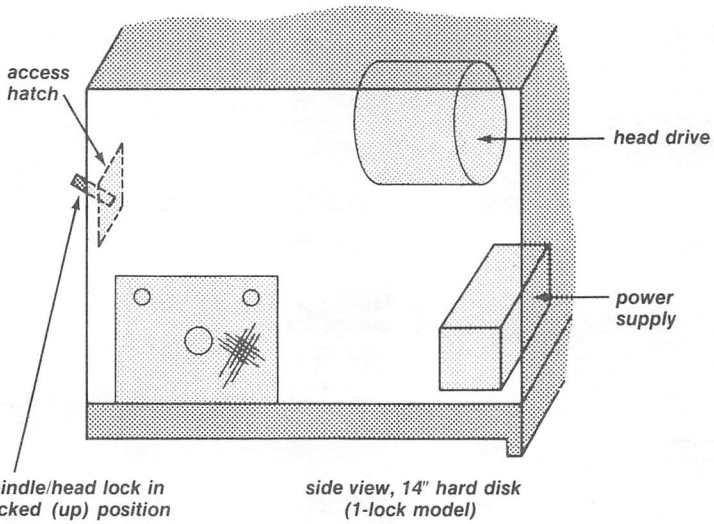


Figure 3-13

Removing the 14" Hard Disk

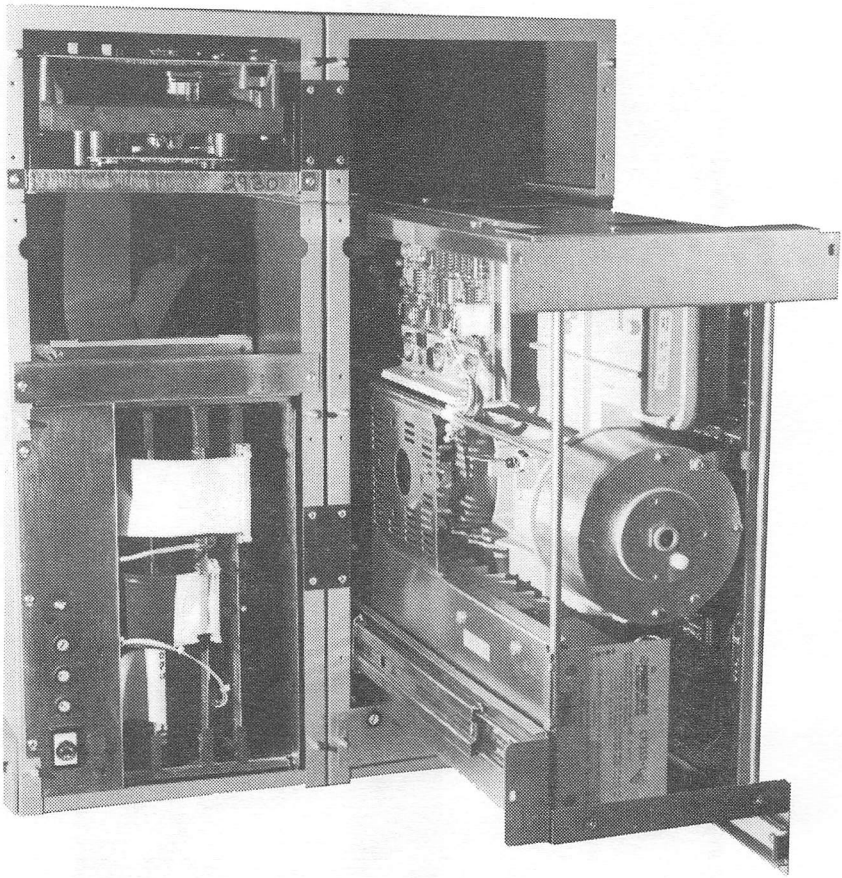


Figure 3-14

14" Hard Disk Cabling

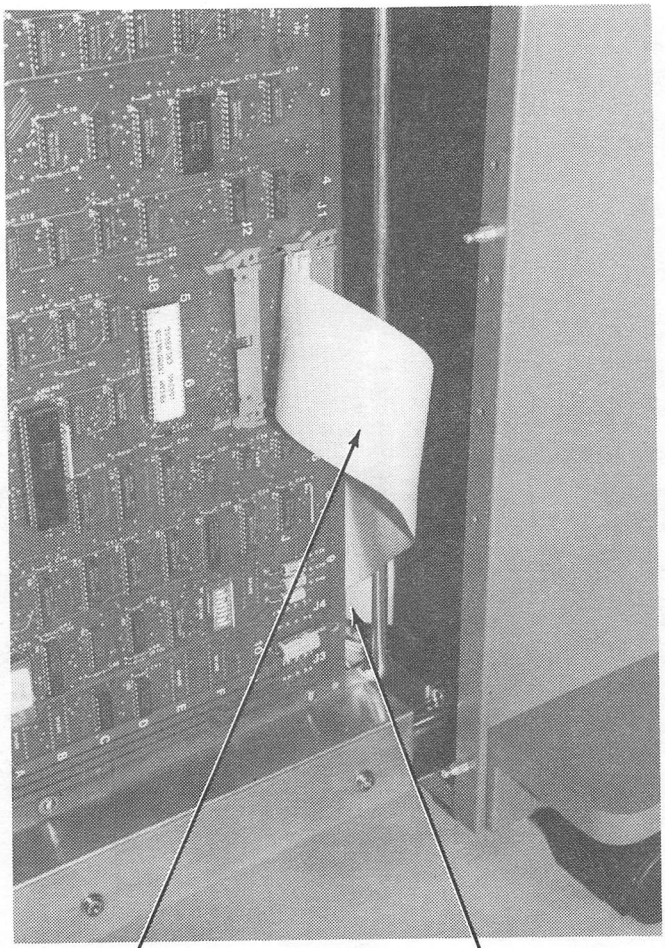
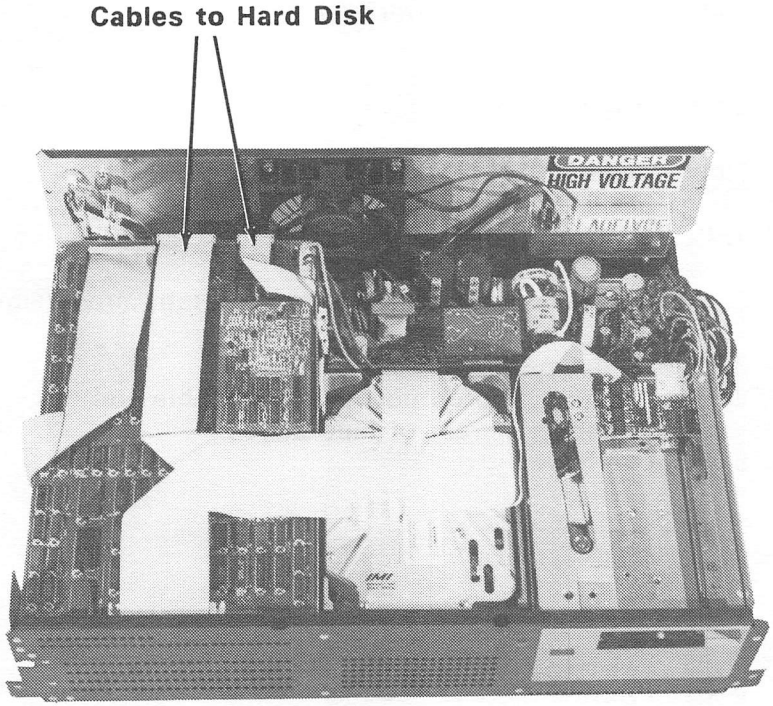


Figure 3-15

Hard Disk Cabling (Desktop)



3.2.9 DC Power Harness (Desktop)

Disconnect Power Supply/Backplane connectors and remove the harness as a unit. In the case of a power supply/backplane soldered connector, remove the backplane by unscrewing its fastening screws and removing the backplane and harness as one unit (this will require a long screwdriver).

3.2.10 Tape Drive

Floor-Standing

1. Remove front cover of the cabinet labeled "File Server."
2. Unscrew two screws on front of the tape drive (Figure 3-16).
3. Slide out tape drive.
4. Unhook multicolored power supply cable and flat ribbon cables at rear of tape drive.
5. Remove drive.

Desktop

1. Remove top cover.
2. Remove cables.
3. Remove two screws that connect the tape drive to the front of the cabinet (Figure 3-17).
4. Slide the cabinet out the hole in the front panel.

Figure 3-16

Tape Drive Pulled Out
(Floor-Standing Model)

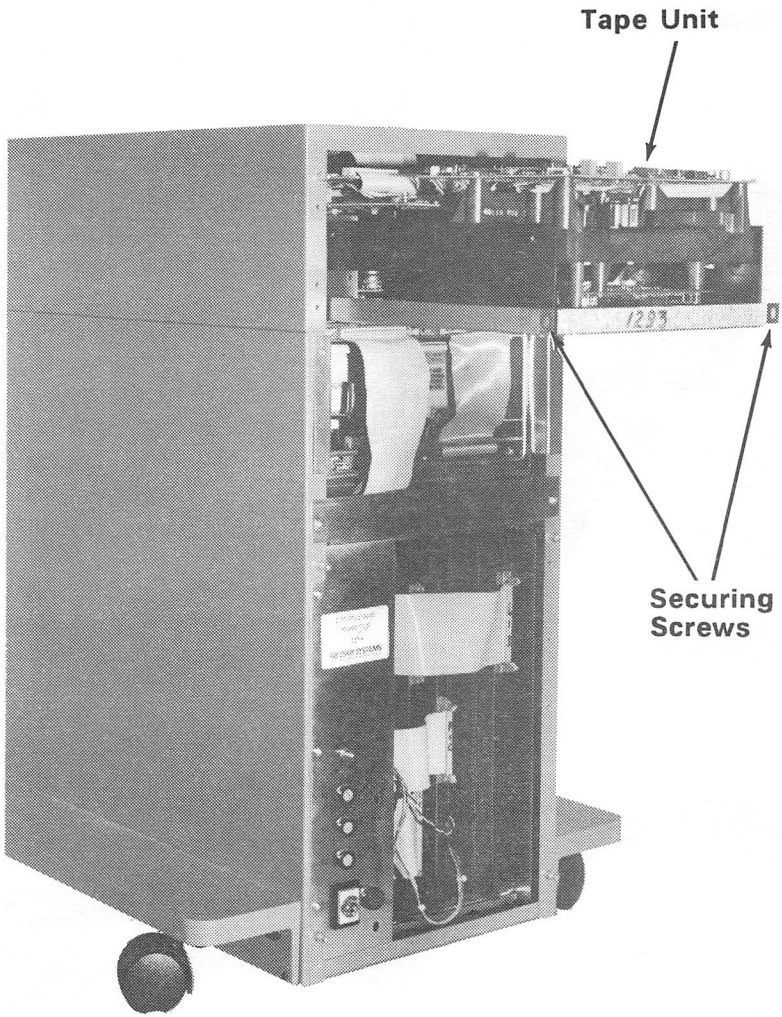
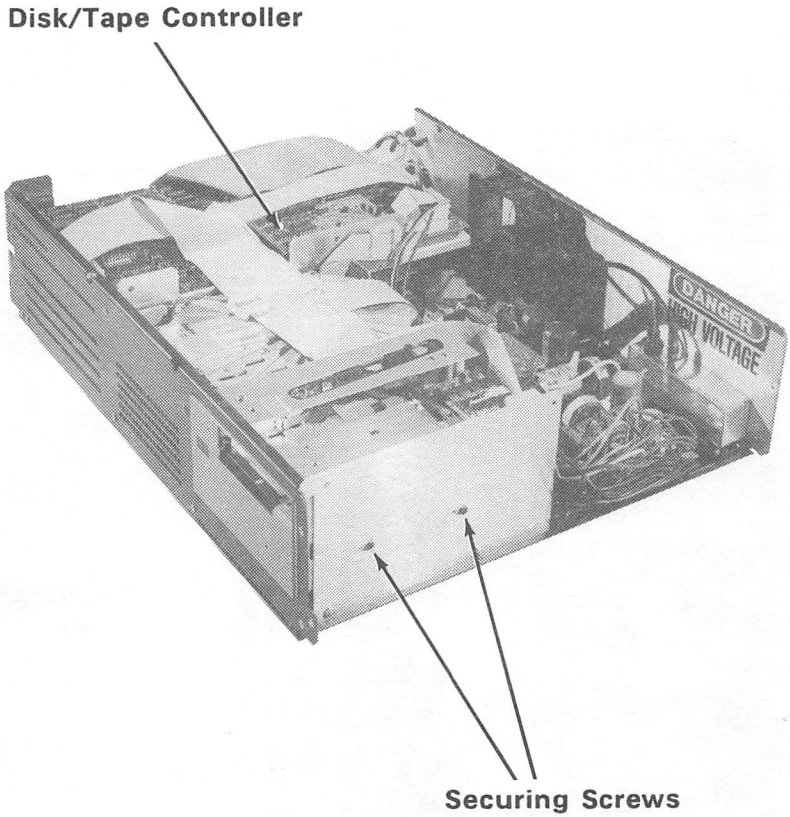


Figure 3-17

Tape Drive (Desktop)



3.2.11 Power Supplies

Floor-Standing

60 MB Hard Disk

1. Remove front and rear covers of cabinet labeled "File Server."
2. Lock the disk.
3. Unplug the AC power.
4. Disconnet internal HUB and PIC cables to peripheral HUB boards on back panel; put rear panel aside.
5. Remove disk, tape, PIC, and power cables from D/T controller, which is mounted on the disk power supply.
6. Unscrew two screws on front brackets holding disk.
7. Slide the disk out the front.
8. Tip file server and unbolt power supply (four largest screw heads on bottom of file server).

Desktop

1. Remove top cover of the file server.
2. Detach all cables, noting their location (Figure 3-18).

Standard Model

1. Undo three nuts on the power supply front bracket.

SSI Model

1. Tip cabinet forward onto front face.
2. Unscrew four screws on bottom plate.
3. Don't let the power supply fall out as the last screw is removed.

3.2.12 Removing the Fan

Desktop

1. Unplug wires.
2. Remove four corner nuts and bolts (Figure 3-18).
3. Extract fan.

Floor-Standing

Unplug file server power cord.

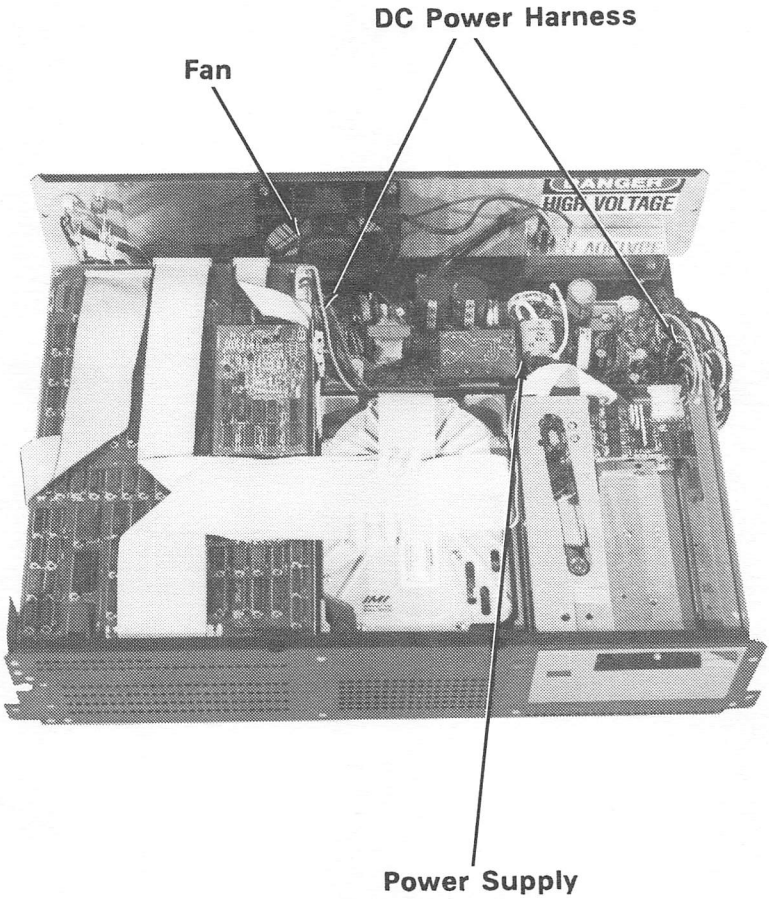
1. Pull the tape deck out, after removing the two screws on the front of it.
2. Remove signal and power cables from the tape drive.
3. Remove fan screws.
4. Unplug AC power from fan.
5. Reverse this procedure to reinstall the fan.

3.2.13 Workstations

1. Unplug computer and console.
2. Disconnect network coaxial cable.

Figure 3-18

Power Supply and Fan (Desktop)



Chapter 4

Troubleshooting: File Server Hardware

This chapter is divided into five sections:

4.0 Introduction

4.1 File server will not power up

4.2 File server software will not execute

4.3 File server hangs, crashes,
or won't talk to other network stations

4.4 Other errors in file server operation

Network symptoms are listed in Table 3-1 (page 3-8) and Appendix A.

Hardware error messages and **file-server error and information messages** are discussed in Appendix B.

Differentiating hardware from software problems is discussed in Section 3.0.3.

General rules for troubleshooters are found in Section 3.0.4.

Reference will be made to

PLAN System Physical Planning and Installation Manual (GA40-0101)

PLAN File Server Installation and Operation Manual (SC40-0300)

The Physical Planning Manual will be referred to as "PPM" and the PLAN File Server Installation and Operation Manual as "PIO".

4.0 Introduction

In general, the field service representative will fix hardware problems but not software problems. However, since some network symptoms are ambiguous, the representative will need to differentiate between hardware and software problems whenever possible. See Section 3.0.3 for more on this.

Repeating the hardware trouble indicators of Section 3.0.3.1:

1. The file server won't power up
2. No disk or tape will boot
3. The file server boots and functions normally, but can't talk to other stations
4. A functioning, proven system suddenly slows down or hangs
5. The network runs too slowly

Each file server subassembly is discussed in some detail in one subsection. In this chapter:

TERMINAL OR CONSOLE (4.1.2.1)
MODEM (4.1.2.2)
DC POWER SUPPLY (4.1.3.1)
MOTHERBOARD (FILE SERVER) (4.1.3)
FILE SERVER INTERNAL CABLES (4.2.3.2)
DISK (4.2.3.3)
PIC (4.2.3.4)
DISK CONTROLLER (4.2.3.5)
CPU (4.1.2.3, 4.2.3.6)
TAPE DRIVE (4.4.1)
CLOCK/CALENDAR (PART OF PIC) (4.4.2)

Since a subassembly malfunction can cause a variety of

symptoms, the symptom subsections in this chapter will list the subassemblies in order of probable cause, and will reference the subassembly subsections listed above. (However, even though floor-standing file servers may contain one or more internal HUBs, HUBs are discussed in Chapter 5.)

4.0.1 First Steps

When troubleshooting file server or user station hardware, first do the following:

1. Push firmly on all socketed chips and connectors. This will solve up to 20% of user station, hard disk, and peripheral card user-station problems.

2. Check all power connections (Section 3.2.3).

3. Check all fuses (Section 4.1.1.2).

The most common hardware fault is the bad mechanical connection.

4.0.2 Environmental Factors

Network equipment should be located where

a. temperatures are in the range 10-35 C.
b. relative humidity is in the range 20-80%
c. electromagnetic radiation is not present
d. network cables will not be flexed, run over by heavy equipment, or otherwise stressed.
e. vibration is minimized.
f. power surges are absent.

Sample Problems:

1. A workstation contains a chip with a faulty

pin/socket. A slamming door or a jolt to the desk or table breaks or restores the connection in the socket, stimulating multiple recons. The symptom seen by the service representative is degraded network performance caused by multiple recons. Often, adding or removing additional workstations will affect (for better or worse) the recon problem.

2. A workstation overheats, stimulating multiple recons.

3. Thunderstorms cause power surges, which can burn out the file server. Surge protectors/power conditioners, while expensive, can prove worthwhile in an environment where thunderstorms or other causes of power surges are present.

   When a backup power source is involved, it must provide power for HUBs, consoles, and workstations, as well as the file server, if the network is to continue operation.

4.1 File Server Will Not Power Up

SYMPTOMS

#F1	NO POWER LIGHT; NO CONSOLE OR USER STATION DISPLAY	4.1.1
#F2	POWER LIGHT ON; NO CONSOLE DISPLAY; USER STATION DISPLAY PRESENT	4.1.2
#F3	POWER LIGHT ON; NO CONSOLE DISPLAY; NO USER STATION DISPLAY	4.1.3

If the power light and console display are present, but no user displays are present, see Section 5.2.2.

4.1.1 No Power Light; No Console or User Station Display

At power on, the power light on the front of the file server may not come on. In the simplest case, tne light is simply burned out. The file server will boot automatically, and the network will function normally.

If the power light does not come on, and no further network activity occurs, check the following:

1. Is the power cord to the file server cabinet plugged in?
2. Is power actually turned on to the outlet?
3. Is the file server key turned on correctly (floor-standing model) (4.1.1.1)?
4. Are the power outlet fuses intact?
5. Are the file server fuses intact (one fuse only for the desktop file server) (4.1.1.2)?

At power on, the fans should be heard coming on. Silence indicates a problem with AC power.

4.1.1.1 Keying on the Floor-Standing File Server

To power on, turn the key at the bottom front of the cabinet labeled "File Server" clockwise (to a horizontal position), press in, and turn back (to vertical position). This locks the power switch in the "ON" position.

Two keys are shipped with the system.

4.1.1.2 File Server Fuses

Check fuses by swapping them with good fuses of the same value. If you have no good fuses to swap, check the transparent fuses visually. Use an ohmmeter to check the opaque ceramic fuses. (The desktop model has only one

fuse, next to the power switch. The fuse is for AC power.)

Fuses blow because thay are passing more current than they are rated for. This condition has various causes, some due to a fault, some not.

Fuses

Location	Label	Amps (115 V)	Amps (230 V)
Line filter/ switch receptacle (desktop rear)	none	3.125	3.125
Front panel (Floor-standing cabinet labeled "File Server")	F1	10	5
	F2	10	5
	F3	5	3
Front panel (Floor-standing cabinet labeled "Storage")	none	5	2.5

If a fuse blows:

a. Is the fuse the right value (should be marked on the fuse)?
b. Is the type of fuse correct (i.e., most equipment should contain 'SLOW BLOW' fuses on mains inputs. If an antisurge fuse is used, it may blow when the turn-on surge occurs, even though the rating is apparently correct).
c. Fuses that are old tend to deteriorate. They will blow in service. 'Old' replacements can fail quickly if used as a replacement.

If the fuse is failing due to excessive current, causes are (in order of probability):

a. faulty power supply
b. bad wiring
c. defective mains filter (for mains fuses)

d. faulty subassemblies drawing too much current (or short circuit).
e. conductive foreign object in contact with PCB in some subassembly
f. condensing humidity causing conductive water film on subassemblies.
g. incorrect voltage settings for power supplies or subassemblies (mains input in particular)
h. faulty or particularly 'dirty' mains input to unit.

4.1.2 Power Light On; No Console Display; User Station Display Present

In this case, the file server is powered on and user stations are able to boot subsequently. However, no console display is present.

The console (or its modem, for remote consoles) is attached incorrectly, or is defective; or, the file server CPU board cable to console is bad or in the wrong socket; the CPU UART, RS232 drivers, or RS232 receivers are bad.

4.1.2.1 Checking for a Defective or Miscabled Console or Terminal

1. Is the console or terminal power cord plugged in?

2. Is the console or terminal turned on?

3. Is the terminal or console cabled correctly to the file server (Section 4.2.3.2)?

4. Are the terminal switches set correctly (PPM, 3.2.4.1, 4.2.2.1)?

If 1 through 4 check out, the console or terminal is defective. Replace it with a good console. This assumes that the CPU board and the modems, if present, are

installed correctly and are functional (Sections 4.1.2.2, 4.1.2.3, 4.2.3.6).

4.1.2.2 Checking for a Defective or Miscabled Modem

1. Is the local modem cabled to the file server correctly (Section 4.2.3.2)?

If the console or terminal is remote, connected to the file server by modems, check modem installation and switch settings (PPM, 4.2.3.1). If ok, swap modems.

WARNING: Modem/network problems are sufficiently varied and complicated to merit a call to the network manufacturer service staff when such problems arise.

4.1.2.3 Checking the CPU Board

For the floor-standing file server, the CPU board should be in slot 8 (as marked on the front of the card cage). The RS232 cable should be connected to the CPU board in the bottom connector (Figure 4-1). Check to see if it has been connected, incorrectly, to the top connector (when present); also check connector orientation. Connectors are not always keyed. (Connect pin L to pin L; cable stripe indicates pin L.)

In the card cage of the desktop file server, the CPU board usually lies below the PIC board. The RS232 cable should connect the CPU board to the modem outlet via the connector closest to the front of the unit on the CPU board. The other connector on the CPU board, toward the back of the unit, is unused (Figure 4-2). See Section 4.2.3.6 for more on the CPU.

To check for bad CPU UART, RS232 drivers, or RS232 receivers, swap CPUs.

Figure 4-1

RS232/CPU Connections (Floor-Standing)

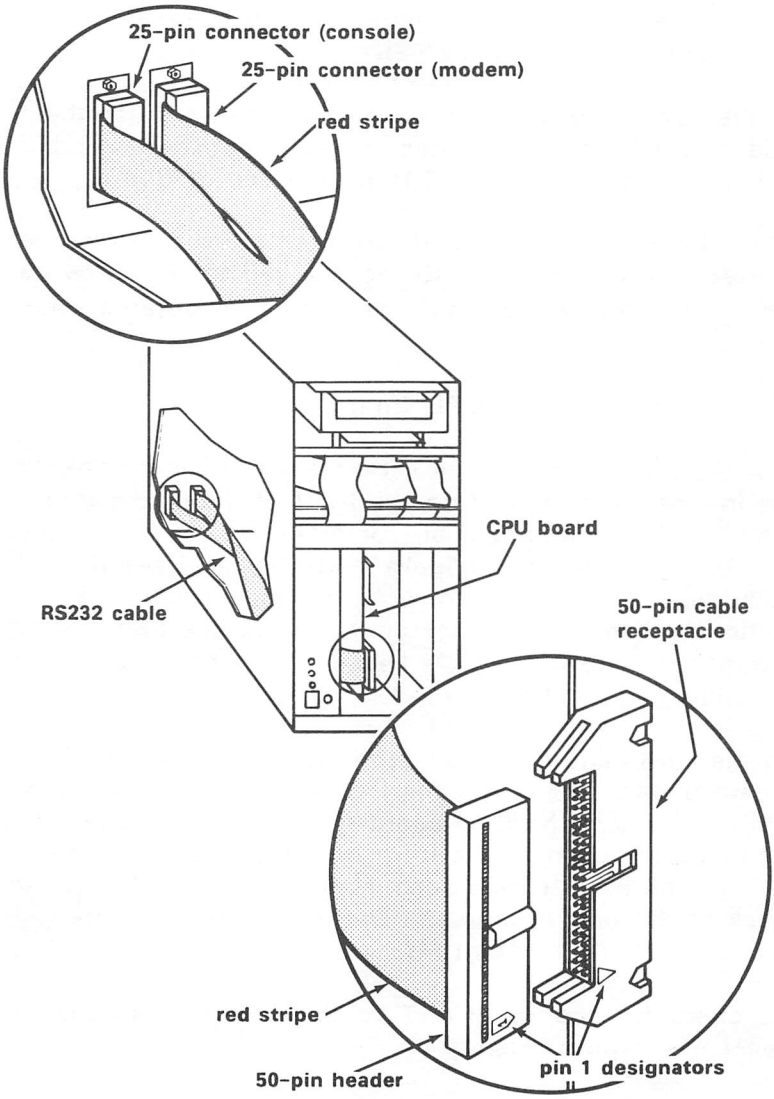
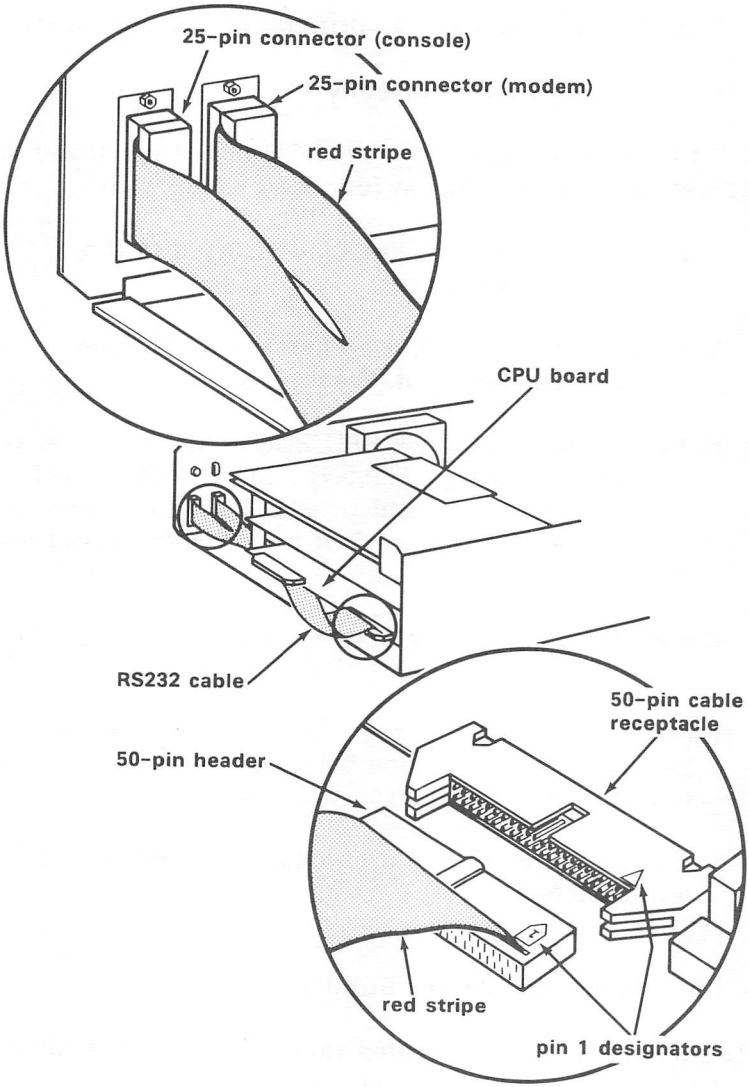


Figure 4-2

RS232/CPU Connections (Desktop)



4.1.3 Power Light On; No Console Display; No User Station Display

If

1. the console is known to be good
2. is known to be cabled correctly to the file server
3. with switches set correctly

but the initial boot menu from ROM is not displayed at power up, then one of the following is the cause:

1. one of the boards is not fully inserted in the cage. Reseat all boards.
2. the console is sending a character to the file server and jamming it. Press RESET.
3. the CPU is bad. Check CPU BOOT ROMs (Figure 4-5) and jumper settings (3.2.6.1) (Figure 3-6). A CPU board in the wrong slot or CPU RS232 miscabling will not cause the user-station problem. Swap in a good CPU.
4. the DC power supply or the cabling to it is faulty (4.1.3.1).
5. one of the boards in the card cage has a short. Remove the boards one by one. If supply voltages return to normal, replace the board.
6. the motherboard has a bad capacitor. Replace the motherboard.

4.1.3.1 Faulty DC Power Supply

The power light on indicates that AC power is available. If no further signs of life exist, check the DC power

supply (which supplies power to the card cage) and the cabling from power supply to card cage.

4.1.3.1.1 Checking Power Supply-to-Card Cage Cabling (Floor-Standing)

Correct voltage at the power supply, but not at one of the connectors on the power supply harness, indicates a bad connector or cable. Replace them. (Figure 3-1; Table 4-1).

Incorrect voltages at the power supply could indicate a faulty power supply or a short at one of the components (disk, tape, disk/tape controller, or card cage). Replace parts to determine which is faulty.

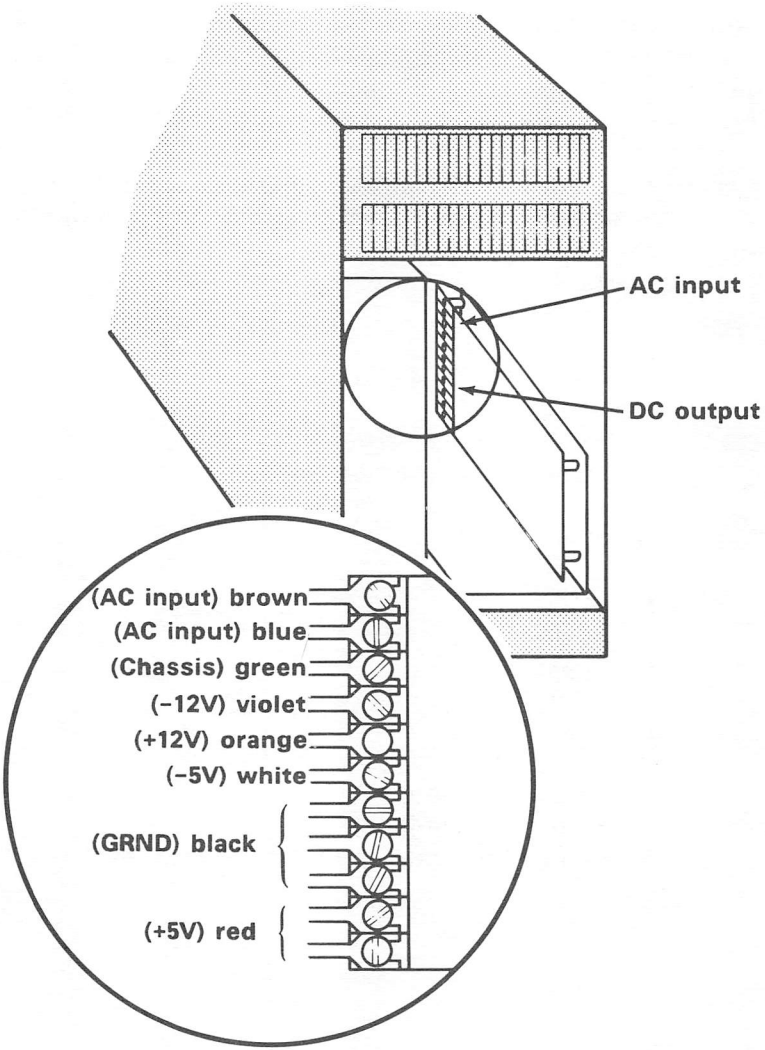
Table 4-1

Power Supply Terminal Voltages
(Floor-Standing File Server)

Terminal		
1	AC in	
2	AC in	
3	Chassis	
4	-12	2A
5	+12	3A
6	-5	0.7A
7	Return (ground)	
8	Return (ground)	
9	Return (ground)	
10	+5	15A
11	+5	

Figure 4-3

Power Supply Voltages
(Floor-Standing Model)



4.1.3.1.2 Checking the Desktop Power Supply Cabling

1. Check the color coding of the wires as they leave the power supply:

0V	BLACK
5V	RED
12V	ORANGE
-5V	WHITE

These wires should be connected as follows:

For STANDARD POWER supply

RED to V1+

BLACK to V1-, V2-, V3- and V4+

ORANGE to V2+ and V3+

WHITE to V4-

For SWITCHING SYSTEMS INTERNATIONAL supply

RED to V1+ (+5)

BLACK to V1- (+5), V2- and V4+

ORANGE to V2+

WHITE to V4-

The wiring to the tape unit (2 connectors), disk unit (1 connector) and disk/tape controller (1 connector) are made with standard connectors wired as follows:

PIN 1 at 12V

PIN 2 and PIN 3 at 0V

PIN 4 at 5V

(With polarizing chamfers at top of connector, PIN 1 is on the LEFT.)

After checking cables, make sure all connectors are replaced and seated firmly on each unit.

2. Remove the cards in the card frame (PIC and CPU) insert a multibus extender card, turn on the power and with a volt meter measure the voltages present to be as follows:

   From right to left on the 86 way connector (from farthest right),

   0V, 5V, 5V, 12V and -5V
   (+5V is on two consecutive connections)

   From left to right on the 86 way connector (from farthest left),

   0V, 5V and 5V
   (+5V is on two consecutive connections)

   Note: 'top' and 'bottom' pins are connected together.

   After checking voltages, turn off, remove extender card and reinsert CPU and PIC in marked slots.

3. Check that all the cables are present and firmly pushed in:

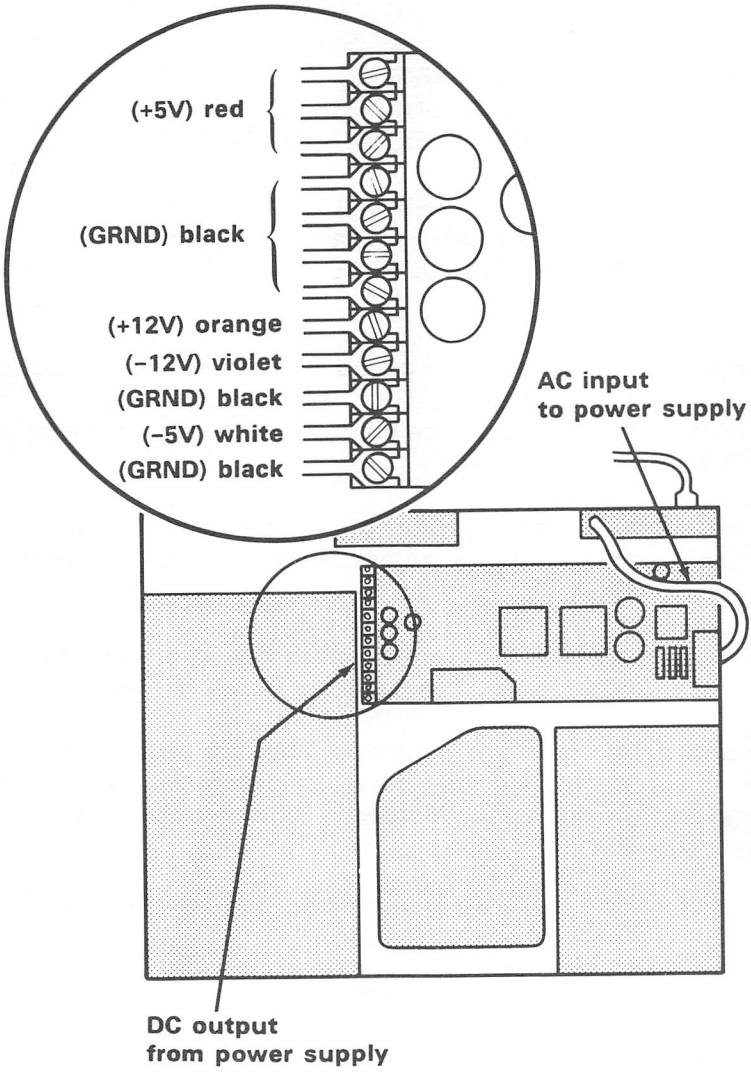
   a. CPU card to BNC, reset switch and RS232 connectors.

   b. PIC card to Disk/tape controller.

   c. Disk/tape controller to Disk unit (34 pin and 20 pin connectors) and Tape unit (40 pin connector)

Figure 4-4

DC Power Supply Voltages
(Desktop Model)



4.2 File Server Software Will Not Execute

SYMPTOMS

#F4	BOOT MENU APPEARS; DEFAULT DISK WILL NOT BOOT; BOOT FROM ANOTHER DISK OR FROM TAPE IS SUCCESSFUL: PROBABLE CPU OR DISK PROBLEM (SEE ALSO 6.1.1)	4.2.1
#F5	BOOT MENU APPEARS; NO DISK WILL BOOT; BOOT FROM TAPE SUCCESSFUL: PROBABLE DISK OR DISK CONTROLLER PROBLEM (SEE ALSO 6.1.1)	4.2.2
#F6	BOOT MENU APPEARS; NO DISK OR TAPE WILL BOOT: PROBABLE CABLE, DISK, DISK CONTROLLER, OR PIC PROBLEM (SEE ALSO 6.1.1)	4.2.3

These symptoms may be caused by hardware or by software (Section 6.1.1). In general, if the boot process has worked in the past, but doesn't work now, the problem is probably in the hardware.

However, if the boot process gets under way, but fails before completion, the problem could be in the hardware or software.

If, from the outset, the boot process does not even seem to begin, the problem is most likely in the hardware.

If the problem is in the hardware, any one of the file server subassemblies may be faulty or improperly installed. Differentiating hardware boot problems is discussed in Section 4.2.3.1.

4.2.1 Boot Menu Appears; Default Disk Will Not Boot; Boot From Another Disk or from Tape Successful: Probable Disk Problem

NOTE: before powering on the floor-standing file server, always make sure that the hard disks are unlocked (PPI, 3.2.3).

The file server should be disconnected from its HUB, internal or external, so that a faulty HUB cannot impede the boot process.

At power on, the file server software should boot automatically from the default disk. If it does not, an error message may or may not be returned.

4.2.1.1 Error Message Returned

When an error message is returned, pressing reset should always allow BOOT to restart. If it does not, power off and on, and when the boot menu comes up, boot from tape or from another disk.

Hardware error messages (Appendix B) will often point to the faulty subassembly, which should then be checked for correct cabling, and replaced if necessary.

If error message $36 is returned (a subcode of 124, DISK ERROR or a primary error message out of the Boot ROM. Known as "INVALID DRIVE ID" to some disk/tape controllers):

For PLAN 4000, a flat cable runs between disk/tape controller and disk. The cable has female connectors at both ends. Check the male connectors on the disk/tape controller and disks for this cable. A bent pin will cause error $36.

For PLAN 3000, such a bent pin or an unformatted disk

will cause this error. For some early PLAN 3000 file servers, a modification to the disk/tape controller may be missing. This will result in various, sometimes massive, disk data errors at any time during operation. Contact your Nestar service representative.

Otherwise, if the file server boots from tape or another disk successfully, the problem most probably lies in the default disk (4.2.3.3) or its cabling (4.2.3.2). An error message may confirm this. When possible, boot from a second disk or from tape to confirm that the problem does not lie in the disk controller.

Note, however, that most problems with the file server boot process and operation can be caused by any of the file server subassemblies.

For some U101 and U103 CPU ROMs before Version 2.2, boot tape errors will cause the file server to hang.

To check the default disk, use the disk utility programs (Section 3.1 and PIO, Chapter 4), especially option i (Examine/Repair Disk Consistency).

If the default disk is definitely bad, reformat it using option j (Format Disk) of the file server utility menu, as the last resort.

WARNING: Reformatting a disk destroys all information on it. Be sure that a backup tape exists before reformatting. The Format Disk option requires a password, which is available from the technical support staff of the network manufacturer.

If the default disk checks out, check out the CPU BOOT ROMS (Figure 4-5), jumpers (3.2.6.1) (Figure 3-6), and cabling (4.2.3.6).

If CPU cabling checks out, swap in a new CPU.

4.2.1.2 No Error Message Returned

If no error message is returned, but boot from tape is successful, the problem is most probably

1. the software (6.1.1)
2. a bad disk controller or cables from disk to controller (4.2.3.5) or PIC (4.2.3.4) (however, if boot-from-tape is successful, the PIC is good).
3. the data is being corrupted between disk controller and CPU. Reformat the disk, restore the disk from tape and try again. The system will usually catch this error and return an error message.

Remember, however, that reformatting a disk destroys all data on it.

4.2.2 Boot Menu Appears; No Disk Will Boot; Boot from Tape Successful: Probable Disk or Disk Controller Problem

This symptom is usually caused by a bad disk, cables to disk, disk controller, or bad software. See Sections 4.2.3.5 and 6.1.1.

If there is only one disk available to the file server, the information in the previous Section (4.2.1) applies here also.

Trouble in the PIC (4.2.3.4) is a less probable cause of this symptom. If boot-from-tape is successful, the PIC is good

4.2.3 Boot Menu Appears; No Disk or Tape Will Boot Probable Cable, Disk, Disk Controller, or PIC Problem

4.2.3.1 Differentiating Hardware Boot Problems

To determine which system subassembly is impeding tl boot process, you may have to work your way through of Section 4.2.3. However, first try the following: remove the PIC-to-disk controller cable. The system should generate "DISK DRIVE NOT ATTACHED TO PIC". I doesn't, swap in a known good PIC.

The appearance of the boot menu suggests that the CP functioning. Any other subassembly may be impeding tl boot process, however.

Listen for fan sound, the whirr of the tape subassembly starting up, disk spinup, and the sound of the boot disk doing a head seek.

For 14" disks, can you see the flywheel turning from in front. For all disks, can you feel vibration?

If the fans and tape subassembly start up, but no disk activity is heard, the problem is most probably in the disk cabling or disk controller. Otherwise, the problem lies in the PIC or the disk itself.

If, no matter which disk or tape is booted from, an Internal Error message is returned, the PIC or disk/tape controller is implicated. However, before swapping parts, contact your Nestar Technical Service Representative. Both hardware and software problems n exist, and a combination of remote diognostic and testing procedures will be necessary to differentate and troubleshoot them. Do not attempt to simply swap subassemblies and restore software from tape to a hard disk.

If a $36 error is returned (for the PLAN 4000), check for bent pins on either end of the cable between the disk and disk/tape controller.

If a $36 error is returned, check for a bent pin in the disk/tape controller cable. In some early PLAN 3000 file servers, a modification to the disk/tape controller may be missing. This will result in massive disk data errors at any time during operation.

The modification is missing if, on the underside of the disk/tape controller, the jumper is missing from the P6 connector pin 6 to the U82 pin 21. Contact your Nestar service representative.

In the following sections, you will be checking cabling, and testing and swapping components, one by one.

In general, when the boot menu is displayed, but the system won't boot, check subassemblies in the following order:

1. Internal file server cabling (4.2.3.2)
2. Disks, especially disk power supplies (4.2.3.3)
3. Power to disk controller board (+5 volts) (4.1.3.1, 4.2.3.6)
4. Disk controller (4.2.3.5)
5. Check that the motherboard has correct voltages (Figures 4-3, 4-4)
6. PIC (4.2.3.4)
7. CPU (4.1.2.3, 4.2.3.6)

Remember that the file server should be detached from its HUB, so that possible HUB problems can be ignored with reference to the boot process.

4.2.3.2 File Server Internal Cabling Problems

If no disk or tape will boot, and no error message is returned, check cabling first (Section 3.2.3). For the floor-standing file server, 60% of problems originate in the cabling.

Sample problems:

1. Loose cables

   a. The cable from disk controller to 8" or 14" disk in the floor-standing file server cabinet may be unattached. Check them.

   b. Are the cables to PIC and tape drive (on back of drive) attached?

2. Miscabling

   a. File server - Console
   b. File server - Modem
   c. File server - Hard disk (second cabinet)
   d. File server - Internal

3. Missing cables: check by eye

4. Defective cabling: swap cables to a subassembly when error messages implicate that component. Check voltages after swapping cables.

If cabling checks out, next check power to the disk controller board (4.1.3.1). Power should be +5 volts.

4.2.3.3 Disk Problems

Having checked cabling and power to the disk controller, check the disks.

Most disk problems will not prevent a successful boot

from tape. When a disk problem is present that prevents a boot from disk, but boot from tape is successful, see Section 4.2.2. Disk problems are presented in this Section to group them with other subassembly problems, which are more likely than disk problems to impede boot from tape in addition to boot from disk.

30% of file server problems originate in the disks.

If the problem lies in a disk, you will probably receive an error message indicating that the disk is not responding. If such is the case, check that the disk is operational by listening for disk spinup and the sound of the boot disk doing a head seek. For 14" disks, look for the flywheel turning in front. Feel for vibration.

If no disk activity is present, check the disk power supplies:

For 5.25" disks, power is cabled from the main DC power supply. See Section 4.1.3.1.

For 8" disks, power is cabled from a separate power supply mounted in the main file server box. Remove the power connector from the disk and check that voltages meet spec.

Pin	Voltage
1	ground
2	+24
3	-5
4	-12
5	+5
6	ground

For 14" disks, power is cabled internally. Check that the disk is receiving AC voltage. Check connector J3 on the disk's main PCB for the following voltages:

Pin	Voltage
2	+24
3	-5
4	-12
5	+5

If voltages are incorrect, the disk power supply has failed or the power harness is bad.

For 5.25" disks, check power harness, then replace the power supply.

For 8" disks, replace the offboard power supply.

For 14" disks, replace the disk unit.

If disk power supplies check out, examine the disks using the file server utilities, when possible (3.1; PIO, Chapter 4).

4.2.3.4 PIC Problems

A bad PIC may prevent the file server from booting, or may cause the network to hang intermittently.

If, no matter which disk or tape is booted from, an Internal Error message is returned, the PIC or disk/tape controller is implicated. However, before swapping parts, contact your Nestar Technical Service Representative.

Both hardware and software problems may exist, and a combination of remote diagnostic and testing procedures will be necessary to differentiate and troubleshoot them. Do not attempt to simply swap subassemblies and restore software from tape to a hard disk.

PIC malfunctions may cause problems with

1. connection to the network. See Chapter 5 for RIM problems.

2. communications to both disk or tape. (If communications to either disk or tape only are bad, however, the PIC is not implicated.)

   Run a cable from the disk/tape to an external drive. If the drive will not function, the problem lies in the disk controller or the PIC. Swap in a good PIC.

3. clock/calendar functions (4.4.2).

   If problems in these areas are encountered, swap PICs.

4. a variety of other network problems, such as corrupted virtual volumes, data errors at user stations, Tape Dump/Restore errors, and data exception (optional feature on all PICs).

If the error message "Bad or missing PIC" is returned, reseat the CPM board and retry, before swapping PICs.

4.2.3.5 Disk/Tape Controller Problems

When boot problems are encountered, check the disk/tape controller after checking cabling, power to the disk/tape controller, disk power supplies, and the PIC.

Check the disk/tape controller also when problems are encountered using the Format Disk utility or other file server utility programs.

If, no matter which disk or tape is booted from, an Internal Error message is returned, the PIC or disk/tape controller is implicated. However, before swapping parts, contact your Nestar Technical Service Representative. Both hardware and software problems may

exist, and a combination of remote diagnostic and testing procedures will be necessary to differentiate and troubleshoot them. Do not attempt to simply swap subassemblies and restore software from tape to a hard disk. To determine disk/tape controller PROM version, see the following Section.

1. First press all chips down firmly on the disk controller board or boards, to insure that any non-soldered, socketed chips are firmly seated.

2. Next, run a cable from the controller to an external drive. If the drive will not function, the problem lies in the controller or the PIC.

3. If you haven't done so already, swap in a good PIC. If the drive still does not operate, swap controllers.

Widely varied symptoms can also be caused by incorrect versions and mismatches of firmware for the disk/tape controller and tape drive. Contact your Nestar service representative for correct Rev levels and Rom-vs-tape drive matches.

For PLAN 3000:

For System Release 4 software, the disk/tape controller boardmust have ROM level D.

For PLAN 4000:

For System Release 4 software, the disk/tape controller board must have ROM level K.

Note that in some earlier versions of the file server, the disk/tape controller is located on the left-hand side of the cabinet (looking at the cabinet from in front of it), not as depicted in this manual.

4.2.3.5.1 Determining the Disk/Tape Controller PROM Version

In some cases, a Nestar service representative may ask you for the disk/tape controller PROM version for diagnostic purposes.

If it is inconvenient to examine the disk/tape controller board, and if the file server is operating, the disk/tape controller version number can be obtained for diagnostic purposes via the SHOW ID command. Disk/tape version number will be the second field of the second line returned.

If the file server is not operating, use the file server utility "Examine/Modify Disk Contents" to determine PROM version.

Run the utility and in response to the prompt

I(nfo, Q(uit, M(emory), D(isk, F(ile), E(xamine)?

type "M". To the prompt

R(EAD, W(RITE, Q(UIT?

type "W". When asked

START?

type "$F1000." When prompted again with

START=987136?

press <Return>. The following will be displayed (on one line), followed by a colon:

```
987136/$F1000:8000 FFFF FFFF FFFF OOFF
              FFFF FFFF FFFF ................
```

Type "800". Another line will be displayed:

```
987136/$F1000:9000 1010 1208 FFFF OOFF
            FFFF FFFF FFFF .....
```

The "08" byte in this example is the software version number of the disk/tape controller. (A=1, B=2,... This example shows H-level PROMs.)

To exit the program, answer the prompts as shown:

```
R(EAD, W(RITE, Q(UIT)? W
START= 6602? $F1000
START= 987136? <Return>
987136/$F1000:9000 1010 1208 FFFF OOFF
            FFFF FFFF FFFF .....
           :c000
987136/$F1000:8000 FFFF FFFF FFFF FFFF
            FFFF FFFF FFFF .....
R(EAD, W(RITE, Q(UIT)? Q
I(nfo), Q(uit), M(emory), D(isk), F(ile),
     E(xamine)? Q
```

4.2.3.6 CPU Problems

See Section 4.1.2.3 for more on the CPU.

1. Are the BOOT ROMs connected correctly? (Section 4.2.3.6.1, Figure 4-5)

2. Are the CPU jumpers attached correctly on the CPU board (Figure 3-6)? As discussed in Section 3.2.6, the PLAN 3000 CPU board requires an additional jumper not present on the PLAN 4000 CPU board.

3. Check the CPU card cabling to the RS232 connectors, and the cabling from the RS232 Connectors to console and/or modem (4.1.2.3, Figures 4-1, 4-2).

4.2.3.6.1 BOOT ROMS

Check BOOT ROM part numbers to assure that the ROMs are current Rev. Use Figure 4-5 to insure that the ROMs are correctly installed.

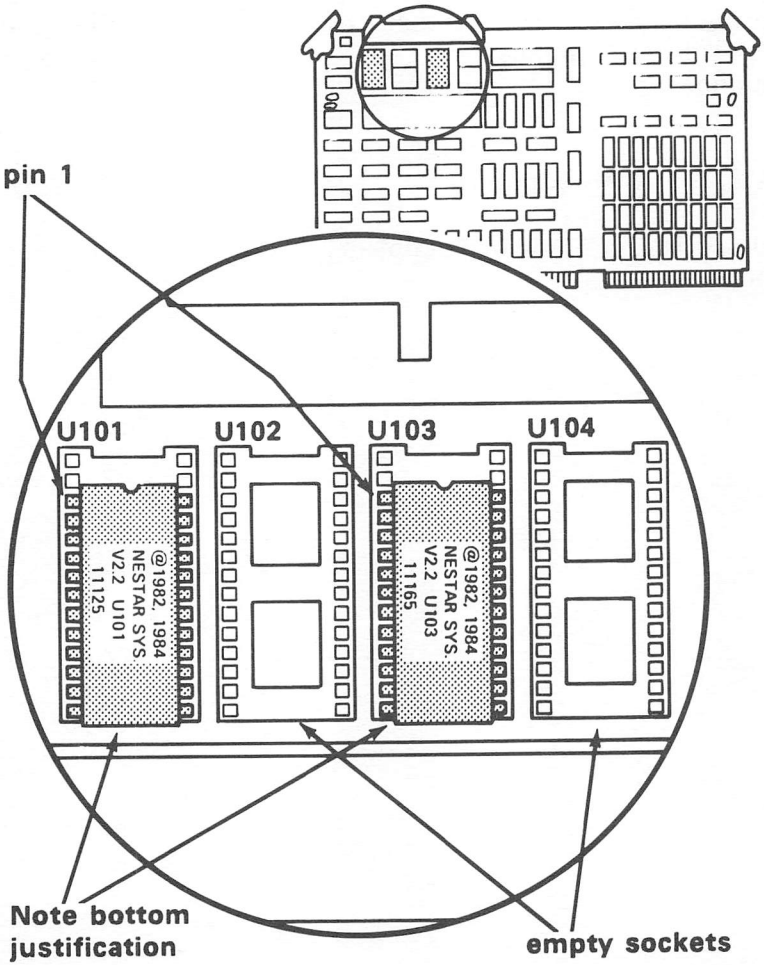
BOOT ROM version can also be checked using the NET program SHOW ID command. The third field of the second line of the response returned is the CPU ROM version number.

4.2.3.6.2 CPU Jumpers

Using Figure 4-5 and Section 3.2.6.1, check CPU jumper orientation.

Figure 4-5

CPU BOOT ROM Connections



4.3 File Server Slows, Hangs, Crashes or Won't Talk to Other Network Stations

SYMPTOMS

Remember that for File Server Releases earlier than 2.2, if a key is pressed on the console during file server operation, all network activity is interrupted until a network command is entered and <Return> is pressed, or until <Return> is pressed. Long-term solution: password protect the file server console. Enter the password in the file server startup file (PIO, Section 2.4).

For later releases, network activity is suspended as keystrokes are entered at the console, and as console commands are processed. However, if three seconds elapse after a keystroke, network activity will resume until further keystrokes are entered.

In addition, the console or terminal may hang for a number of reasons. Reset the console or terminal.

The file server power cord may have been loosened or disconnected. Check the power cord and insure that it is plugged in securely.

Check for bad coaxial cables. For symptom #8, check to see if the console still responds. If so, the problem is network/HUB related (Chapter 5).

Symptoms 7-8 are most often caused by a faulty HUB. See Section 5.1 for a full discussion of HUB problems; see the following 4.3 subsections for less probable causes.

Widely varied symptoms can also be caused by incorrect versions and mismatches of firmware for the disk/tape controller and tape drive. Contact your Nestar service representative for correct Rev levels and Rom-vs-tape drive matches.

For PLAN 3000:

For System Release 4 software, the disk/tape controller boardmust have ROM level D.

For PLAN 4000:

For System Release 4 software, the disk/tape controller board must have ROM level K.

4.3.1 File Server Operates, but Can't Talk to User or Other Server Stations

If the file server operates correctly, but can't communicate over the network when connected to a HUB:

1. confirm that the file server address is correct (Appendix C). Are the PIC address shunts broken correctly? Is the address shunt in upside down?
2. hook a known operational user station directly to the file server PIC via the file server BNC connector at the bottom of the file server back panel. If the user station can boot and communicate via the NET program with the file server, the problem is in a HUB, or the coaxial cables. If the two stations cannot communicate, the

problem is in the PIC or the PIC cable to the back panel BNC, or the coaxial cable.
3. try a different HUB port.
4. try a different HUB.
5. swap in a new PIC. The PIC RIM chip may be bad.

See also HUB problems, 5.1.

4.3.2 File Server Hangs or Slows Down During Operation

4.3.2.1 Bad Shunt in Cardcage Motherboard

If the hanging problem is relieved by moving the CPU to a different slot in the cardcage, the shunt found in the cardcage motherboard is implicated. Replace the shunt.

4.3.2.2 Other Causes

1. User/file server software interfaces may occasionally cause the file server to hang in versions of the file server previous to 2.2. Disconnect the file server from the network by unplugging it from the HUB it is connected to for 10 seconds, then reconnect.

2. A power surge or other one-time event may cause the file server to hang. Reboot the file server (remembering to remount, at the file server, all requisite user-station and non-file server volumes).

3. The file server terminal may also hang on a one-time basis. Reset the terminal and press the return key several times to clear the file server's serial port. Resetting the terminal sometimes causes a character to be sent to the file server.

4. Some file servers require a console in order to boot without hanging. If no console is present, noise on

the RS232 line to the CPU line may be interpreted as a character, and the boot menu will be presented. In the absence of a console, no key can be pressed to continue. Reset the file server to continue.

5. If a console is present, confirm that it is connected to the file server correctly.

6. If the file server won't reboot, see Section 4.2 (File Server Software Will Not Execute).

7. If the problem recurs, the cause is probably a loose cable or bad PIC (4.2.3.4). Check file server cabling, starting with DC power supply cabling (4.1.3.1, 4.2.3.2). Check that the reset switch cable is firmly seated in its PIC connector.

8. In the case of 14" hard disks, notice if the disk is spinning. If not, power supply cabling is suspect. If cabling checks out, swap disk/tape controllers.

9. In some early PLAN 3000 file servers, a modification to the disk/tape controller may be missing. In this case, missing disk data errors of various types may be returned. The modification is missing if, on the underside of the disk/tape controller, the jumper is missing from the P6 connector pin 6 to the U82 pin 21. In this case, contact your Nestar service representative.

Otherwise, see Sections 5.1 and 5.2 for HUB and RIM problems, external network cabling problems, and other causes of network slowdown and hanging.

4.3.3 File Server Crashes

If the file server crashes (usually because of a power failure), record the contents of the console and the file server. If it reboots successfully, remount all network station volumes (user station, print server,

etc.) that were unmounted by the crash.

These volumes can be remounted at the file server console, when necessary, to allow stations to save data held in their local memories. If no data needs to be saved at a station (including servers such as print servers), should simply reboot.

Network stations will not function normally on the network until all necessary volumes have been remounted for them.

4.3.3.1 File Server Crash Destroys Boot Volume

If the file server will not boot from the default disk after a crash, the boot volume on that disk may have been damaged.

Boot from tape and press <Escape> to avoid execution of the file server program. From the utility menu that appears, select the "Check/Repair Disk Consistency" option. If the disk is bad, attempt to repair it using the utility's "Repair Disk" option.

If the disk still will not boot, select the "Examine/Modify Disk Contents" option.

Rename

/MAIN/SYSTEM/FILESERVER

to

/MAIN/SYSTEM/BADFILESERVER

Quit this option and select the "Partial Tape Dump/Restore" option. Restore

/MAIN/SYSTEM/FILESERVER

from tape to the default disk.

Quit the utility and select "Examine/Modify" again. SET BOOT to

/MAIN/SYSTEM/FILESERVER

Reboot from disk.

If boot from disk again fails, confirm that a backup tape exists. Contact your network manufacturer's technical support staff and reformat the disk.

WARNING: Reformatting a disk permanently destroys all data on the disk. A password must be provided to you by the manufacturer's technical support staff before you can use option j, Format Disk, from the utilities menu.

4.3.4 File Server Will Not Issue Console Commands; Other File Server/Console Problems

Local Use

If a file server, at installation time or after previously working fine, suddenly will not respond to commands issued at the file server console, insure that the file server CPU is firmly in its slot in the card cage.

If a DEC VT100 Series console is being used in VT52 mode, disable the XON/XOFF protocol.

Remote Use

If a remote terminal will communicate successfully with a file server, but commands are not echoed successfully to the local file server console, replace the cable that connects the file server CPU to the back panel modem and console ports.

4.4 Other Errors in File Server Operation

SYMPTOMS

4.4.1 Tape Drive Hardware Problems

As discussed in Section 2.4, tape drive heads should be cleaned on a regular basis. Otherwise, fatal Partial Tape Dump/Restore errors, verify errors, and other such tape problems will occur. (Of course, these errors can also have other causes, such as a bad PIC).

If such an error, or a CONTROLLER ERROR 101 ($65), or a tape hard data error is encountered:

1. Clean the tape heads.
2. Try a new tape, properly tensioned.
3. Check tape drive and disk/tape controller cabling (Section 4.2.3.2).
4. Check tape drive and disk/tape controller hardware (Section 4.2.3.5).

Tape drive hardware problems beyond dirty heads should be referred to the network manufacturer.

For some U101 and U103 CPU ROMs before Version 2.2, boot tape errors will cause the file server to hang.

For more information on the TAPEDUMP utilities (Partial and Full), see Section 6.1.3.

4.4.1.1 LSI Drives

1. For use with LSI tape drives, the disk/tape controller PROMs with part numbers 610-0028n and

610-0029n (where n = the PROM Rev level) must be Rev K or higher.

2. There are two LSI models, 904SL and 904SL2. The model number is found on a plate mounted on the back of the drive below the PC board. For the L2, remove the jumper CC, which is part of a block of jumpers at the rear of the tape drive, immediately in front of the power connector.

3. For drive 904SL, the PROM at location 4H on the PC board should be part number 80174-004.

   For drive 904SL2, the PROM at location 4H on the PC board should be part number 80182-004.

If condition 1 is not met, tapes written by the LSI will not be readable by other drives.

If conditions 1-3 are not met, a variety of errors may be encountered, including "Unexpected file mark" messages, and prompts for the next tape before the current tape is completely written.

4.4.2 Clock/Calendar Problems

The file server clock/calendar resides on the PIC. Its battery should last several years.

If clock/calendar or its battery fail, swap PIC.

Chapter 5

Troubleshooting: External Network Cabling, HUBs, User Workstations, Non-File Server Stations

This chapter is divided into three sections:

5.0 Introduction

5.1 Network Hangs or Slows During Operation (HUB and Network Cabling Problems)

5.2 User and Server Station Problems (Servers other than File Servers)

Network symptoms are listed in Table 3-1 (page 3-8) and Appendix A.

Hardware error messages and **file-server error and information messages** are discussed in Appendix B.

Differentiating hardware from software problems is discussed in section 3.0.3.

General rules for troubleshooters are found in section 3.0.4.

Reference will be made to

System Physical Planning and Installation Manual (GA40-0101)

PLAN File Server Installation and Operation Manual (SC40-0300)

The Physical Planning Manual will be referred to as "PPM" and the PLAN File Server Installation and Operation Manual as "PIO".

5.0 Introduction

A number of network symptoms immediately suggest a bad HUB or HUB port:

1. adding a HUB or workstation hangs or slows down the network.
2. the network seems to freeze for several minutes, then resumes operation.
3. the network freezes; disconnecting and reconnecting the file server or powering the file server off/on causes activity to resume.
4. recabling a frozen station to a different HUB port allows the station to function correctly.

One symptom immediately suggests incorrect cabling or a bad RIM chip on a user NIC:

1. from the time it is first cabled, or with the addition of a new station, the network runs too slowly.

User and server station problems (servers other than file servers) are indicated when

1. a single station on the network does not operate correctly.
2. all workstations of the same type, on a network with workstations of more than one type, do not operate correctly.
3. the addition or removal of arbitrary workstations influences network stability.

Although all of these symptoms may have other causes, and faulty HUBs, cabling, workstations, and non-file server stations may cause problems not listed, the correspondences above are the most common.

Remember that before following any troubleshooting checklist, you should ask such questions as:

- is the file server (user station, other server station, HUB, console, modem) plugged in?
- is it turned on?
- is power actually available through the outlet?
- is the file server software executing?

Subassemblies discussed in this chapter:

EXTERNAL NETWORK CABLE (5.1.1)
HUB (5.1.2)
NIC (USER STATION) (5.2.1)
WORKSTATION COMPUTER (5.2.6)
80-COLUMN CARD (USER STATION, WHEN PRESENT) (5.2.6)
MOTHERBOARD (USER OR NON-FILE SERVER STATION) (5.2.6)

5.1 Network Hangs or Slows During Operation (HUB and External Network Cabling Problems)

SYMPTOMS

#H1 NETWORK HANGS OR SLOWS DURING OPERATION OR WHEN NEW HUB OR NETWORK STATION IS ADDED OR POWERS DOWN (SEE ALSO 5.2.1, 5.2.1.1, 6.1.6) 5.1

Many problems result in one of two network symptoms: the network **runs too slowly,** or the network **hangs during operation.**

"Network runs too slowly" is hard to define quantitatively, in the absence of network performance diagnostics. In borderline cases, the service representative will have to rely on his/her experience to differentiate between a heavily loaded or otherwise "normally" slow network, and a network too slow because of incorrect installation or some other problem.

Causes for these symptoms are:

1. Heavy loading. Extensive network use may cause a temporary network slowdown. Turn DISPLAY ON at the console to check for workstation activity such as file server commands. Temporarily disconnect print servers, file transfer servers, etc., to check for increased network speed.

   Note, however, that the file server does not display network I/O activity, and in general is not useful for troubleshooting.

   Remember that use of "shadow" file servers, when present, doubles network traffic.

2. In some older versions, the file server may have entered a tight software loop with a particular station. Disconnect the file server from its HUB for 10 seconds, to allow it to clear its queues.

3. Incorrect network cabling (5.1.1)

4. Bad HUB or bad HUB port (5.1.2)

5. Bad RIM chip in a user station NIC or server PIC (4.2.3, 5.2.1)

6. NIC or PIC address shunt with duplicate address (5.2.1)

7. Bad crimping at a coax/BNC or fiber optic/connector connection point (5.1.1; PPM, 5.1)

8. Someone has QUIT the file server, causing all user and server virtual volumes to be unmounted. These volumes must be remounted at the file server, or the affected stations must **reboot** and remount the volumes, before the stations can resume operation.

   Stations will often display a message such as STACK OVERFLOW when this condition occurs, whether or not the file server has resumed operation.

5.1.1 Incorrect Network Cabling

If a network seems to be running too slowly, performance is probably being degraded by excess retries or recons. Check the following:

1. Check for cable loops between network nodes. User stations, servers, and HUBs can be connected in any topology without loops. (There can never be more than ONE cabled path from any station or HUB to any other station or HUB.)

2. Passive HUBs cannot be connected to each other without an intervening active HUB.

3. Cable lengths from nodes to active HUBs are limited to 2200 feet for coax, 1650 feet for fiber optic, 2000 feet for IBM Cabling System twisted-pair.

4. Total cable that can be connected to a passive HUB is 200 feet.

5. No two stations can be separated by more than 10 HUBs.

6. Total transmission time between most distant nodes is 31 microseconds. See PPM, Appendix E, to calculate transmission times.

7. All passive HUB ports must be terminated: all ports must be terminated with a resistor or attached to a powered or unpowered user or server station, OR one (and only one) port must be attached to an active HUB, with the other ports terminated with a resistor or attached to a user or server station.

8. Is the crimping correct between coax cables and BNC connectors? Jiggle wires near BNC connectors and watch for bursts of activity (See PPM, 5.1.1). Are fiber optic cables attached to connectors correctly? (PPM, 5.1.2)

Failure to follow these cabling rules may or may not result in degraded network performance. Any problems that do arise, such as timing skews and propagation delays, will result in excess recons and retries, and thus in degraded performance.

If cabling is correct, check for a bad HUB (5.1.2) or workstation problem (5.2).

5.1.2 Bad HUB

Bad HUBs generally cause a functioning network to slow down dramatically or to hang. Symptoms appear at the file server and/or at user workstations and other server stations. Signs of a bad HUB:

- blinking LED on a HUB
- no HUB LEDs lit
- frozen or sluggish network

Two types of LED exist, sometimes mixed in one HUB. One type glows brightly and is easily seen from above or below when lit. The other type glows only within, and can only be seen by looking directly into it. Always check leds by looking directly into them, even if some are easily seen to be lit.

It is not always obvious from blinking leds on HUBs that excess reconfigurations are occurring. The COUNT utility program, available in the IBM PC DOS network environment, can be of use here.

Check first (for external HUBs):

1. Is the HUB plugged in?

2. Is the HUB's fuse (if, any) good?

3. If the HUB has an off/on switch, is the HUB turned on?

Some internal HUBs may freeze when connected to an external HUB. Power off/on the file server to unfreeze the HUB.

If the green light on the front of the internal HUB board goes off while the network is active, then the HUB is probably frozen.

Contact your network manufacturer for more information.

If HUBs check out, check for incorrect cabling (5.1.1) or workstation problems (5.2).

5.1.2.1 Bad HUB Port

A single port on a HUB can be bad. This is discovered, for example, when a user station hangs, then functions correctly when connected to a different port on the same HUB. If the defective port is needed, replace the entire HUB.

Coax, fiber optic, and twisted-pair cable can only be connected to the HUB ports appropriate to that kind of cable.

Single-port problems are most often related to a bad port filter, especially in early-version PLAN 4000 internal HUBs.

However, the problem may be caused by a weak signal from the user or server station involved. Possible causes of weak signals are overheating in the workstation, network cable impedence mismatches, low power supply voltage on workstation or file server, or bad NIC or PIC filter.

In such a case, switching to another HUB port may solve the problem because the new port is able to handle the weak workstation signal. If the signal subsequently weakens further, switching HUB ports will no longer work.

5.2 User and Server Station Problems (Servers Other than File Servers)

SYMPTOMS

A few general notes on user and server station problems:

1. A single HUB port can be bad. If one user station has problems, try connecting it to a different HUB port.

2. When user and server stations have problems, check

to insure that the file server software is actually running, and that the file server is actually connected to the network via a good HUB port.

3. If the user or server station is connected to an active external HUB, make sure that the HUB is plugged in and turned on.

4. Is the crimping correct between network cabling and BNC connector (PPM, 5.1.1)? Wiggle the user station cable at station and HUB ends, and watch for a change in node/network activity. Are fiber optic cable/connectors correct (PPM, 5.1.2)?

5. Check the file server address punched out on its PIC address shunts: is the address correct ($FE, for example, and not $EF) (Appendix C)? Confirm that the address is not $00 or the same as some other station's address.

6. Intermittent bursts of recons indicate duplicate station addresses.

7. Someone has QUIT the file server, causing all user and server virtual volumes to be unmounted. These volumes must be remounted at the file server, or the affected stations must **reboot** and remount the volumes, before the stations can resume operation.

   Stations will often display a message such STACK OVERFLOW when this condition occurs, whether or not the file server has resumed operation.

8. General network instability caused by the addition or removal of random workstations usually signifies faulty hardware in a specific workstation (5.2.6).

Network slowdown and network hanging are also discussed in Sections 4.3.2, 5.1.

5.2.1 Network Slows Down or Hangs when Workstation Boots: Removing the Station Frees Up the Network

If disconnecting a workstation (user or server) causes network activity to resume, the problem lies in the workstation, or its cabling to a HUB (or, with very low probability, a bad HUB, other file server subassembly, or user station software). This is a physical link problem.

Before addressing this problem, however, disconnect the file server from its HUB for 10 seconds, in case the user station and file server are in a loop (an occasional problem in some early file server versions). If activity resumes, the problem is not in the hardware.

1. Swap in a new workstation NIC and reconnect to the network, from another known, operational workstation. A bad RIM chip or bad address shunt (duplicate address or address $00) are the most common causes of this problem. See Appendix C for information on addressing shunts.

   Warning: duplicate addresses can cause problems that vary according to otherwise innocuous configuration parameters, such as

   - Length of cables
   - Configuration of active HUBs
   - Use of passive HUBs
   - Workstation signals sent simultaneously to a server

   Intermittent bursts of recons indicate duplicate station addresses.

2. If unsuccessful, swap cable from HUB to workstation, using cable from another known, operational workstation. Cable includes network

connector. See PPM, Sections 5.1 and 5.2 for workstation cabling information.

If swapping is not successful, the problem may lie in the file server PIC (4.2.3.4) or the HUB (5.1.2).

5.2.1.1 Network Runs Slowly; Removing or Adding Any Single Station Affects the Network Intermittently

Indicates an unstable network: redundant station addresses or a $00 address is usually present.

Intermittent bursts of recons indicate duplicate station addresses.

Other possible causes:

a. bad HUB port(s), connected to passive HUBs.
b. PIC problem
c. software overload
d. bad workstation

If station addresses and a.-c. above check out, you must identify the faulty workstation. This can be difficult when large numbers of stations are present, especially when the problem is intermittent. Simply disconnecting stations one-by-one will not absolutely identify the problem station, since removing a good station may stop the recons for a while.

Locating an intermittent hardware problem, such as a loose pin in a socket in a workstation, can prove challenging. For IBM PC workstations, try running the COUNT utility. Issue a Locate command from COUNT. If the commands stimulates recons, the station is suspect. For non-IBM workstations, try the same thing using a NET command.

Once the faulty workstation is identified, see section

5.2.6 to troubleshoot it.

5.2.2 No User or Server Station Will Boot (Other than File Server)

Most probable causes:

1. The file server software isn't operating. Is the file server running?

2. The file server HUB connection is not operational. For floor-standing file servers, check the short cable on the back of the cabinet, which connects the file server to an internal HUB BNC.

3. Check the file server address punched out on its PIC address shunts: is the address correct ($FE, for example, and not $EF) (Appendix C)?

4. The HUB to which the file server is connected doesn't work. Swap HUBs.

5. One user station is causing excess recons. Remove all user stations and add user stations to the network one by one, slowly.

5.2.3 No User or Server Station Will Talk to a Particular File Server

1. Is the file server software running?
2. Is the file server console screen frozen? Press the space bar. If nothing happens after a short time, reset the file server terminal.
3. Is the file server addressed correctly? See Appendix C.
4. Connect the file server to a different HUB port or HUB connection.

5.2.4 Single User Station Won't Boot

1. Confirm that the file server software is running, and that the file server is connected to the network.
2. Switch HUB ports
3. Swap HUB-to-workstation cable
4. Swap workstations
5. Check station address. Is it unique (and not $00)?

For user station hardware problems, see the section 5.2.6 subsection for the appropriate environment.

For user station software problems, see Chapter 6.

5.2.5 User or Server Station Hangs; Network Unaffected

1. Confirm that the file server software is running, and that the file server is connected to the network.
2. Connect the station to a different HUB port.
3. Swap HUB-to-workstation cable.
4. User station hardware problems: see the 5.2.6 subsection for the appropriate environment. (E.g., is the unit overheated?)
5. Swap in a new NIC
6. User station software problems: see Chapter 6.

5.2.6 Other Workstation Problems

Some problems are peculiar to a certain computer. See the following subsections for information on specific types of workstations.

Workstation software is discussed in Chapter 6.

See also the service manual for each machine for troubleshooting information. The following subsections

present a few of the most common workstation hardware problems.

A bad PIC can cause corrupted virtual volumes, data errors at user stations, and other transient but persistent problems.

When appropriate, use the CARDCHK diagnostic program. (Contact the manufacturer's technical support staff for more information on CARDCHK or see the CARDCHK User's Manual for the appropriate computers).

In the case of intermittent problems, look first for faulty pins, sockets, and other physical connectors, and check for overheating in the machine.

5.2.6.0.1 Defective Shunts

Occasionally, defective shunts are encountered, in which some shunt wires that appear to be unbroken, in fact make only an intermittent connection. With such a shunt, the workstation appears to switch from one address to another.

When a workstation loses mounts at a file server, communicates only intermittently with a file server, or runs too slowly, check the station address using the NET or COUNT utilities, or a file server utility.

5.2.6.0.2 NIC Rev Levels

NIC Revs are indicated by a letter in the series A, B, C.... The earliest Rev is A. The NIC Rev level is indicated in a white square on the board.

1. NICs with different REVs can be mixed on the network.

2. Some NICs, REV A-C, will not work with some IBM PC

lookalikes. Symptoms:

a. user station hangs
b. software returns the message "Can't find NIC"

5.2.6.1 Apple // Problems

MAKE SURE WORKSTATION IS POWERED OFF.

Note: The Apple //, at power down, will cause two or more recons instead of one.

NIC problems:

1. If the NIC is suspect, test it with the Cardchk utility program.

Motherboard problems:

1. A chip is not seated firmly, or a chip pin is bent or broken. Press all chips down firmly on the board. Check for bent pins or broken pins.

Card in wrong slot:

1. The NIC must be in a slot higher than any disk controller card (Figures 5-1, 5-2).

80 column card problems:

1. The network supports the ALS, MnR, and VIDEX cards.
2. The video card must be in slot 3.
3. A video card may have been inadvertently switched to the 40- or 80-column screen mode when the other mode was desired.

4. Dirty connectors. Clean connectors with cleaning fluid and cloth or impregnated pad.

Monitor problems:

1. The monitor is not plugged in or turned on.

Overheating:

If a station operates correctly for a while after power on, and then hangs, the computer may be overheating.

1. Install a fan.

2. Check the NIC. If the chip at 11A is the tristate part 74LS646, remove the resistor packs rp3 and rp4, if present. These packs can cause the computer to hang at higher temperatures.

   If the chip at 11A is part 74LS647, however, the resistor packs are required.

"Unsupported Version of SYSTEM.APPLE"

If an Apple // won't boot, and returns this message, two possibilities exist:

1. A file server with an outdated version of the BOOT program is answering the machines power-on bootme request. Press <Esc> and at the "VOLUME TO BOOT" prompt, type in $NN<pathname>, where $NN is the address of a file server with a current version of the BOOT program, and <pathname> is a bootable volume.

2. A chip is bad on the motherboard.

Figure 5-1

Apple // NIC

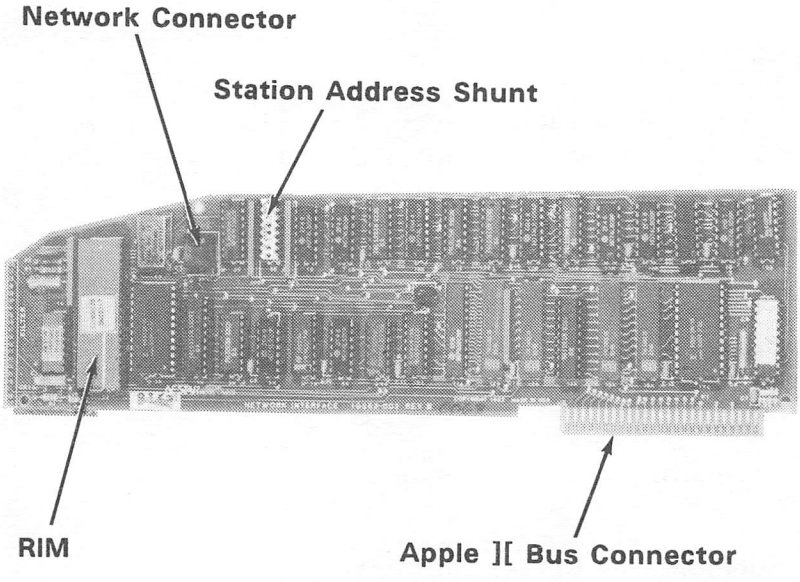
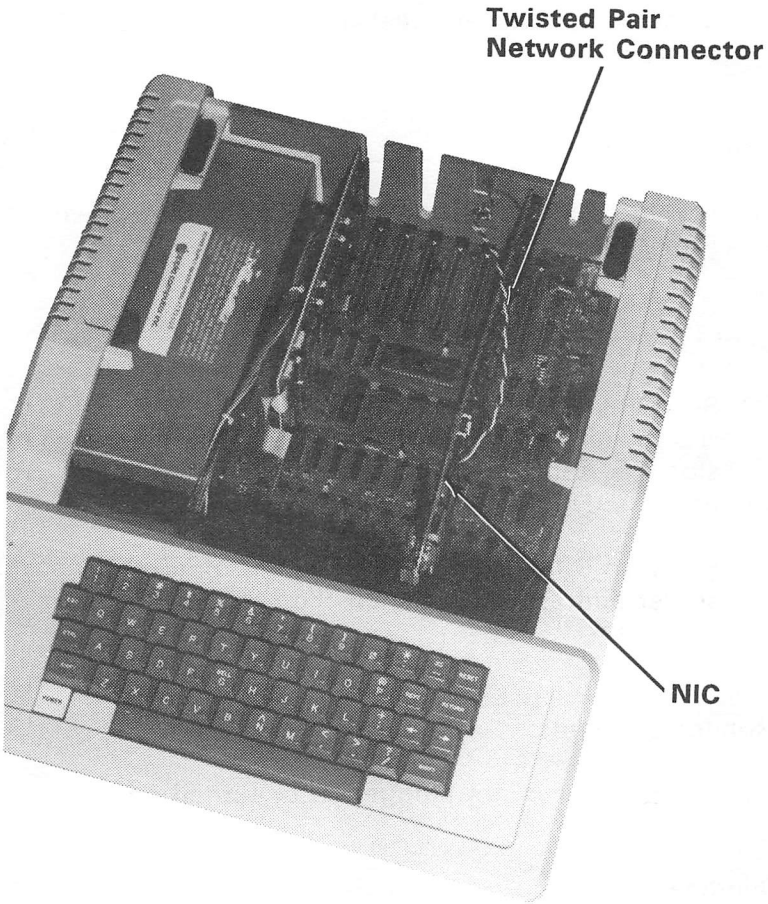


Figure 5-2

Apple // NIC in Place



5.2.6.2 Apple /// Problems

MAKE SURE WORKSTATION IS POWERED OFF.

NIC problems:

1. If the NIC is suspect, test it with the CARDCHK utility program.

Motherboard problems:

1. A chip is not seated firmly. Press all chips down firmly on the board.

Card in wrong slot:

1. SOS.DRIVER contains specification of slot for the NIC (usually slot 2). If the NIC is in some other slot, the Apple /// will hang during the boot process (Figures 5-3, 5-4).

   See also 6.1.4: SOS.DRIVER specification of file server address must match the actual file server address.

Monitor problems:

1. The monitor is not plugged in or turned on.

Overheating:

1. No commercial fan is currently available.

Figure 5-3

Apple /// NIC

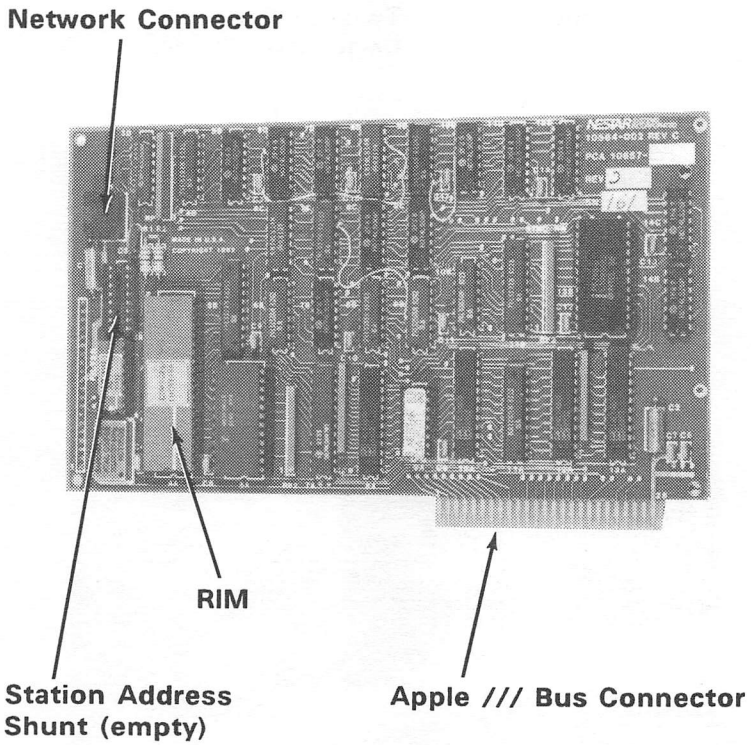
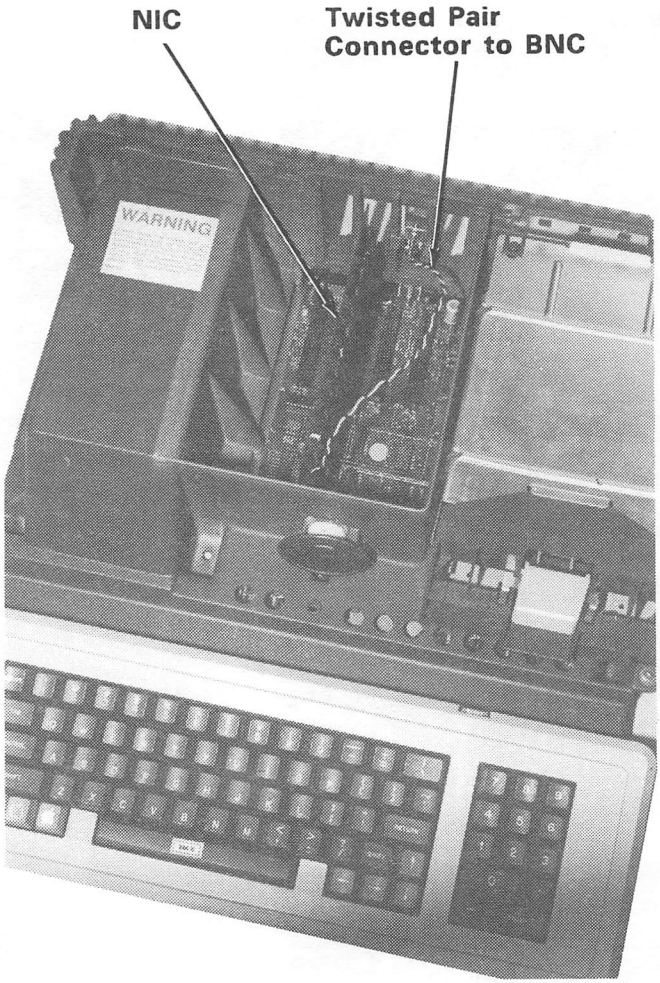


Figure 5-4

Apple /// NIC in place



5.2.6.3 IBM PC Problems

The IBM PC has self-test facilities. If IBM PC hardware is suspect, follow the Problem Determination Procedures in the IBM PC Guide to Operations (6936741).

5.2.6.3.1 LED Activity

There are two lights on the IBM NIC's BNC bracket. The upper light (green), when lit, may signify network activity, although the light is also lit when the workstation is disconnected from the network. When the workstation is properly connected to the network, the light will be on, though varying in intensity (with a flicker). It should not be flashing. When the network is reconfiguring, light activity will vary from 1.5 Hz flash to a 1.5 Hz flicker, with the light generally on.

The bottom light (red) signifies workstation network access, and will only be lit when network software is executing in the workstation. This light should not be lit steadily, but should flash to indicate communication between stations on the network.

5.2.6.3.2 Selftests

In a station that can boot from net, the code in the NIC ROM does a simple selftest of the RIM chip and the RIM buffer RAM. The PC's own BIOS also checks the NIC ROM.

The message "D300 ROM" indicates that the NIC ROM is bad. The message "net<bn>" indicates that the RIM chip is defective. The message "net<nr>" indicates that the RIM-buffer RAM on the NIC is bad.

These messages will show up when the machine is rebooted. If the machine has no local drives to boot from, BASIC will start up and quickly overwrite these messages.

5.2.6.3.3 Duplicate Station Detection

In the IBM PC, the level four code is always on the lookout for packets with the right Arcnet address but the wrong Ethernet address. If such a packet is seen, the message "Net<du>" is printed on the screen. This indicates that there is another station on the network with the same Arcnet address as the station that the message appeared on.

5.2.6.3.4 IBM Board Problems

MAKE SURE WORKSTATION IS POWERED OFF.

1. If the NIC is suspect, run the Cardchk utility program to test it.

2. The interrupt (IRQ) line used by the Nestar NIC is IRQ 2. If another card in the IBM PC is using the same interrupt line, the user station will not work properly on the network. Change the IRQ line on the other peripheral card if possible (some expansion boards use more than one interrupt). Contact your dealer or check the card manufacturer's documentation for information on how to do this. If you must change the IRQ line on the Nestar NIC, see PPM, 5.2.3, for information on how to do so.

5.2.6.3.5 Other Expansion Board Problems

Adding an expansion board with more than 512K can prevent the station from booting.

This is not a network problem. Some IBM PC machines with 256K onboard cannot be populated with 512K additional memory. System units are memory mapped above 640K.

5.2.6.3.6 Other Problems

PARITY ERROR 1

PARITY ERROR 1 is sometimes encountered. This is an IBM PC error, not a network error.

Probable software cause: Program bugs that access uninstalled memory will trap out with parity errors; undeclared memory is the usual software cause. Check the PC switch settings.

Probable hardware cause: If proven software is running, the problem is most likely in the hardware. Parity errors at power up indicate memory chip failure, incorrect switch settings (showing more memory than is in fact present in the machine). Check for bent pins and other faulty connectors. Run the memory portion of the diagnostics.

Anomalous clicks

Anomalous clicks in the IBM PC DOS environment may indicate that you are in DOS "print console" mode. This mode will send all characters typed or sent to the screen, to the printer as well. The clicks come from the virtual printer sending a buffer full of characters to the spool volume.

The mode can be entered, sometimes accidentally, by typing <Ctrl><Prtsc> or <Ctrl>p.

The same sequence disables the mode.

96, Bad or missing interface card

If the machine enters the boot menus, but returns this message when DOS is booted, check to confirm that the address set by the programmable shunt package in the "ADD" socket is in the range $C800 - $F400.

Some PLAN 2000 IBM PC workstation NIC memory addresses are set at $C000. When upgrading these machines to PLAN 3000/4000, the addresses must be changed to the range $C800 - $F400 (recommended $D200).

See Section 6.1.5.1 for IBM PC software problems.

Figure 5–5

IBM PC NIC

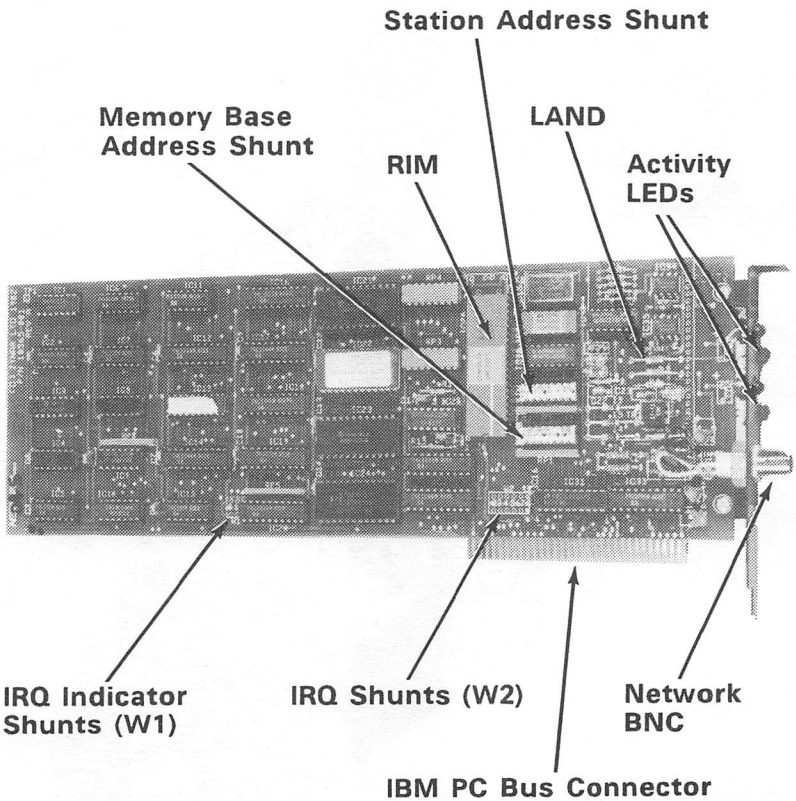
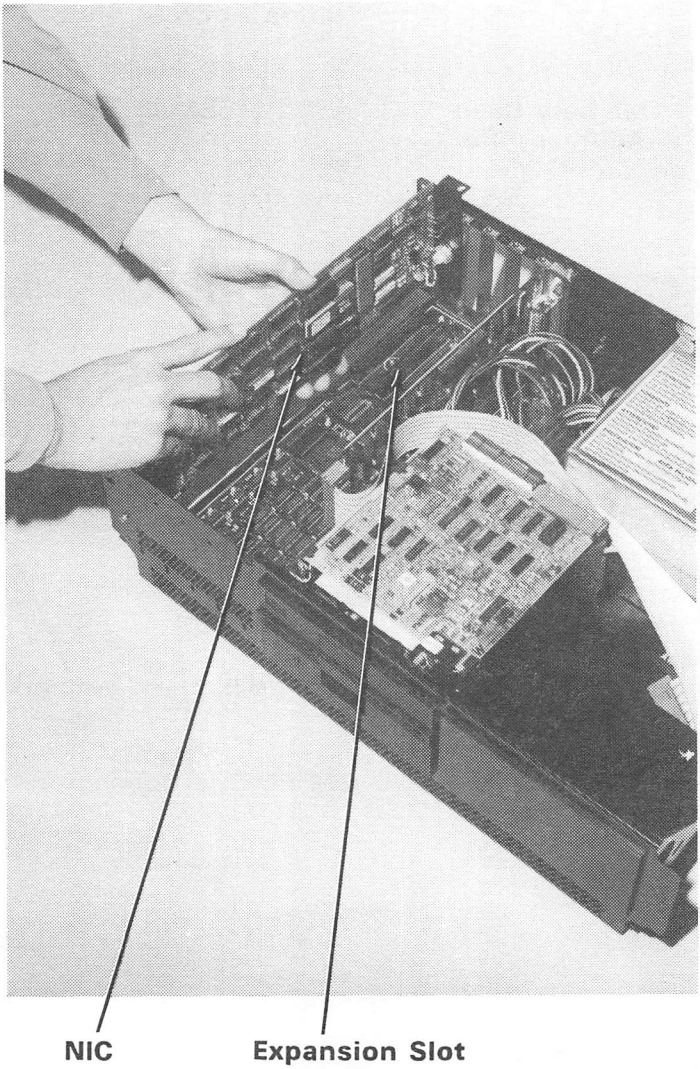


Figure 5-6

Inserting the IBM PC NIC



5.3 Server Problems (Other Than File Server Problems)

Non-file server hardware symptoms and problems are the same as for user stations. See the relevant user station symptoms and solutions.

For server software problems, see Section 6.2.

5.4 EMI Radiation

Some early HUBs and NICs require modification when lower radiation noise levels are required. The NICs may require a capacitor rerouting; HUBs must have a high quality ground. Further noise reduction may be obtained by adding ferrite beads to some cables or NICs (at a cost of more severe distance limitations to the network).

This applies to IBM NICs prior to REV E and internal HUBs prior to REV B.

Contact your Nestar service representative for details.

Chapter 6

Troubleshooting: Software

This chapter is divided into four sections:

6.0 Introduction

6.1 Network software problems

6.2 (Non-File) Server Software Problems

6.3 Application program problems

Network symptoms are listed in Table 3-1 (page 3-8) and Appendix A.

Hardware error messages and **file-server error and information messages** are discussed in Appendix B.

Differentiating software from hardware problems is discussed in Section 3.0.3.

General rules for troubleshooters are found in Section 3.0.4.

Reference will be made to

PLAN Series System Physical Planning and Installation Manual (GA40-0101)

PLAN File Server Installation and Operation Manual (SC40-0300)

The Physical Planning Manual will be referred to as "PPM" and the PLAN File Server Installation and Operation Manual as "PIO".

6.0 Introduction

In general, the field service representative will not solve software problems. However, since many network symptoms are ambiguous, the representative will need to differentiate software from hardware problems whenever possible. See Section 3.0.3 for more on this subject.

Repeating the software trouble indicators of Section 3.0.3.2:

1. File server will not run the first time; older version will run.
2. An application program hangs the system.

6.1 Network Software Problems

SYMPTOMS

Network software is version-dependent. Since there are up to 50 individual pieces of network software, each with a version number appropriate to it, the potential for mixing incorrect software versions on a network is significant. Mixed software can cause the system to hang or malfunction in various ways.

When software is suspect:

1. check version numbers for mismatches
2. check also for unauthorized and obsolete releases.

Contact the network manufacturer for consultation and latest information on software troubleshooting.

6.1.1 File Server Will Not Boot

Assuming that all subassemblies are correctly cabled and operational (Section 4.2.), two possibilities exist:

1. boot volume has been damaged: restore from a backup tape, reset boot pointers using the SETBOOT COMMAND from the "Examine/Modify Disk Contents" option of the file server utility menu (F(ile) option), and try again.
2. bad pointer to the file server boot volume: boot from tape and do a SHOWBOOT command from the "Examine/Modify Disk Contents" option of the file server utility menu (F(ile) option). The boot volume should be

   /MAIN/SYSTEM/FILESERVER

If an INTERNAL ERROR is returned at boot time, contact a Nestar Technical Support representative. A combination of software and hardware problems may be present, and a combination of remote-diagnostic procedures and onsite tests will be necessary to differentiate them.

6.1.2 File Server Boots; No User Station Will Boot

Assuming that network hardware is operational (5.2.2):

1. necessary user boot software may not be present on the file server volumes.
2. old or mismatched software versions may be running.

Example:

The file server boots on a network that consists solely of IBM workstations, but no workstation will boot. Adding an Apple workstation to the network, or mounting an IBM workstation volume for the workstation via the

file server console and doing a DIR of that volume, allows the workstation to boot.

Cause of problem:

The network is running an old version of the software, which fails to initialize all necessary parameters.

Solution:

Make note of all requisite version numbers and contact the network manufacturer.

6.1.3 TAPEDUMP Program (Partial or Full) Won't Work

For tape drive hardware information, see Section 4.4.1.

1. The Full and Partial Tape Dump utilities, accessed from the file server utility menu, use the same physical tape cartridges, but Full and Partial cartridges are formatted differently.

   If a Full Tape Dump tape is used with the Partial Dump utility, the utility will search the tape fruitlessly for 9 minutes before (depending on version number) aborting or asking for "the next tape" during the loading operation.

   If a Partial Dump tape is used with the Full Dump utility, the utility will quickly return an error message and abort.

2. File server tape drives are not all the same (Section 6.1.3.1). All file server tape drives use the same kind of cartridge tape, but put different amounts of data on it. If a tape has been used with a drive of one data capacity and is then inserted

into a drive of a different capacity, Partial Tape Dump will run 5 minutes and return an UNEXPECTED FILE MARK error (90% of the time) or a HARD DATA ERROR (10% of the time).

The Full Tape Dump will return a HARD DATA error after a minute or two.

3. Changing tapes while using either of the Tape Dump utilities may cause a "TAPE POSITIONING ERROR". This error is nonfatal; the software will recover and continue normally.

4. Using a tape created by PLAN 3000 on a PLAN 4000 network (or vice versa) may cause "unexpected filemark" errors or hard data errors.

5. A bad PIC can cause fatal Partial Tape Dump/Restore errors, verify errors, and other such problems.

If, during tape dump/restore activities, Controller Error 101 ($65) or HARD DATA errors are encountered (other than in the cases mentioned above), see Section 4.4.1 (Tape Drive Hardware Problems). Also see Section 4.4.1 if LSI drives are present.

6.1.3.1 Determining Tape Drive Size

Floor-Standing

There are two versions of the drive in this floor-standing unit, the 90I and the 90L. Drive version can be identified by checking the front of the drive. For the I version, the drive has two printed circuit boards, one mounted right side up and the other mounted upside down. The L version has a single board mounted right side up.

For the L, only 45 MB drives are used (904SI).

For the I, 20 MB and 45 MB drives are used (9020I, 9045I). To differentiate them, find the three-digit number in black on the front/top/right edge of the tape drive. If the middle digit is 0, the drive has 20 MB capacity. If the digit is 4, the drive has 45 MB capacity.

Desktop

Only 45 MB capacity is available. Model number 54590, found on a label on the side of the drive, indicates 45 MB, 90 ips.

NOTE: Always mark newly-made tapes with the drive capacity used, to avoid later incompatibility problems.

6.1.3.2 DISK ERROR 37 00 00

This error generally indicates, in earlier file server versions, that there is a marginally bad sector on the hard disk. The "Check/Repair Disk Consistency" utility will not always report such a bad sector; the "Partial Tape Dump" utility is stricter, returning "DISK ERROR 37 00 00".

Reformatting the disk usually solves this problem. However, no disk should be formatted unless a good backup exists, and then only after consultation with the Nestar Technical Support staff.

6.1.4 User Station Won't Boot a Particular Operating System

1. Replace the "SYSTEM" files for that workstation environment on all file-server shared library volumes.

2. Apple ///: As distributed, the Apple /// boot

diskette has its SOS.DRIVER file configured for file server station $FE.

If the file server has some other address, modify SOS.DRIVER using the System Configuration program on the System Utilities diskette. ("Edit driver parameters" option), to enter the correct file server address.

Setting up boot diskettes is discussed in the Apple /// appendix of the PLAN File Server Installation and Operation Manual.

6.1.5 Other Workstation Problems

If a workstation seems to lose mounts at a file server, or to communicate intermittently with a file server, or runs too slowly, the problem is most probably duplicate addresses on the network. See Section 5.2.6 for other causes.

6.1.5.1 IBM PC Software Problems

Damaged Directory:

1. In version 3.0 of the network support for DOS 2.0, mounting a volume of different size over a currently mounted volume will damage the directory of the new volume, if writes are attempted to it. Check the NETWORK.SYS file. It must be 19344 bytes in length. The earlier versions of NETWORK.SYS, which cause this problem, are approximately 17000 bytes in length.

2. **Warning: The MS DOS 2.0 ASSIGN command will not work when more than 8 drives are used. Damage to volumes may result if ASSIGN is used for any volume when more than 8 volumes are mounted.**

3. A bad NIC may cause directory damage. See Section 5.2.6.3.4.

6.1.6 Network Runs Too Slowly

In some early versions of the file server, user/file server software interfaces may occasionally cause the file server to hang. Disconnect the file server from the network by unplugging it from the HUB it is connected to for 10 seconds, then reconnect.

A power surge or other one-time event may cause the file server to hang. Reboot the file server (remembering to remount, at the file server, all requisite user-station and non-file server volumes).

6.1.7 Error Messages

Hardware and file server error and information messages are listed and explained in a general way in Appendix B. Some errors, which are known to have specific causes, are discussed in this Section or in other referenced sections in the manual.

Although located in the software trouble-shooting chapter, some of the following errors may be caused by hardware problems. Such cases are noted.

DISK ERROR 37 00 00

See Section 6.1.3.2.

120,INTERNAL ERROR At Boot Time

See Section 6.1.1.

120,INTERNAL ERROR: FRESPA2 PATH: (either 0 or a pathname)

In some early file server versions, this message on the file server console is often caused by the deletion of large numbers of volumes (mail messages, perhaps). The disk becomes fragmented, with many "free spots" left by deleted volumes. Eventually, more free spots exist than statistically allocated descriptors to point to them.

As the "free spot list" becomes filled, the new free disk areas made available by the deletion of further volumes are not accessible unless a complete "Partial Tape Dump" and restore are performed, making the free space continuous.

Note: The complete error message appears on the file server console screen. User stations display only 120,INTERNAL ERROR, a message which can have many different causes.

$96,Bad or missing Network Interface Card

Returned when DOS attempts unsuccessfully to boot at an IBM PC workstation. See Section 5.2.6.3.6.

Controller Error 101 ($65); Hard Data Error

When encountered during tape dump/restore activities, see Section 4.4.1 (Tape Drive Hardware Problems).

PARITY ERROR

An IBM error. See Section 5.2.6.3

CAN'T FIND NIC

Rev levels A-C of the IBM PC NIC do not always work with IBM PC lookalikes. In such cases, the message "CAN'T FIND NIC" is sometimes returned at the user station. See also Section 5.2.6.0.2.

Lost Clusters

In some early file server versions, "lost clusters" messages are occasionally returned in the IBM PC DOS environment. However, this error is usually caused by bugs in user applications software. Run CHKDSK to recover.

If user software is not at fault, the disk has been damaged.

Bad or missing PI2

See Section 4.2.3.4.

Program Not Present

When executing an option from the utility menu at the file server, the error message "Program Not Present" may appear (for any option other than MODEM ON/OFF).

Causes:

1. At least one of the directory sectors in the file server boot volume has been damaged. The directory lookup for the requested program is then

unsuccessful. Any network subsystem in the path between the disk and the file server operating system may be faulty, causing the damage.

Check the PIC, disk/tape controller, and the disk itself.

2. The error message will appear if the space bar is pressed before the character key that specifies the utility program to be run. Simply retry, without pressing the space bar.

3. Other causes of this message will require the assistance of a Nestar service representative.

6.2 (Non-File) Server Software Problems

SYMPTOMS

6.2.1 Print Server Problems

If multiple print servers are running, each must have its own volume containing the print server software.

If a user's job is not printed, or the print server is frozen:

1. are the necessary printers turned on, and "on-line"?
2. has a key been pressed on a printer or print server console, freezing it?
3. has a printer/server cable worked loose, fully or partially?
4. has the server screen display (and server) been frozen by a typed Ctrl-S or other screen-freezing key sequence?
5. check for server messages, which may indicate why a job has not printed. Check currently attached setups, file server names, print server name, and printer names.
6. does a printer ribbon or printer paper need to be replaced or provided?

6.2.1.1 Virtual Printers

For the IBM PC DOS 2.0 environment, some prepackaged applications require that the device be called LPT1. In this case, use NETCONFG to name the virtual printer device LPT1, disconnect local printers, and reboot.

6.3 Application Program Problems

SYMPTOMS

6.3.1 Messenger Mail System

Exiting the mail program in an unorthodox way may leave MAIL and NEWMAIL volumes mounted. When the mail program is executed again, IN USE messages will then be returned.

In such cases, run the NET program, do a SHOW MOUNTS command and unmount any MAIL and NEWMAIL volumes currently mounted.

If error 120,INTERNAL ERROR is returned, see Section 6.1.6.

6.3.2 WordStar

If a WordStar print job hangs while outputting to the virtual printer, check to confirm that the virtual printer is named LPT1. Output the job to a local printer to confirm that WordStar's internal parameters are set up correctly.

6.3.3 TCOPY

Exiting TCOPY in an unorthodox way may leave a volume mounted. When the volume is to be used again, an IN USE message will then be returned.

In such cases, run the NET program, do a SHOW MOUNTS command and unmount the volume currently mounted.

Appendix A

Network Symptoms

Some symptoms appear more than once in this list

File Server Will Not Power Up

F1	NO POWER LIGHT; NO CONSOLE OR USER STATION DISPLAY	4.1.1
F2	POWER LIGHT ON; NO CONSOLE DISPLAY; USER STATION DISPLAY PRESENT	4.1.2
F3	POWER LIGHT ON; NO CONSOLE DISPLAY; NO USER STATION DISPLAY	4.1.3

File Server Software Will Not Execute

F4	BOOT MENU APPEARS; DEFAULT DISK WILL NOT BOOT; BOOT FROM ANOTHER DISK OR FROM TAPE IS SUCCESSFUL: PROBABLE CPU OR DISK PROBLEM (SEE ALSO N1)	4.2.1
F5	BOOT MENU APPEARS; NO DISK WILL BOOT; BOOT FROM TAPE SUCCESSFUL: PROBABLE DISK OR DISK CONTROLLER PROBLEM (SEE ALSO N1)	4.2.2
F6	BOOT MENU APPEARS; NO DISK OR TAPE WILL BOOT: PROBABLE CABLE, DISK, DISK CONTROLLER, OR PIC PROBLEM (SEE ALSO N1)	4.2.3

File Server Slows, Hangs, Crashes, or Won't Talk to Other Network Stations

F7	FILE SERVER OPERATES, BUT CAN'T TALK TO USER OR OTHER SERVER STATIONS (SEE ALSO U4)	4.3.1
F8	FILE SERVER HANGS DURING OPERATION (SEE ALSO H1, U1, N5)	4.3.2

Network Software Problems

(Non-File) Server Software Problems

Application Program Problems

Appendix B

Error Codes

B.1 Introduction

Errors in this Appendix are listed in the following order:

Section	Error Type
B.2	Hard Disk and Tape Errors
B.2.1	Hard Disk and Tape Error Codes
B.2.2	Device Error Subcodes
B.2.2.1	Hard Disk Device Subcodes
B.3	Errors While Booting the File Server
B.3.1	Errors While Booting From Hard Disk
B.3.2	Errors While Booting From Server Boot Tape
B.4	System Errors
B.5	File Server Error and Information Messages

B.2 Hard Disk and Tape Errors

Disk error codes are reported in hexadecimal by the file server (the file server program and the various offline

utilities). They consist of two parts:

a. a Disk error code, described in the Disk Error Code table in A.2.1.

b. a device subcode, which is device dependent and describes the details of the error.

You should contact your service representative immediately upon discovery of a hard disk error. Record both the error code and the subcode for your service representative.

B.2.1 Hard Disk and Tape Error Codes

HARD DISK ERROR CODES

CODE (HEX)	DESCRIPTION
00	GOOD EXECUTION
01	GOOD EXECUTION; SEEK RETRY AFTER SEEK FAULT ERROR
02	GOOD EXECUTION; SEEK RETRY AFTER CYL MISMATCH ERROR
04	GOOD EXECUTION; DATA RETRY AFTER ID CHECK SUM ERROR
05	GOOD EXECUTION; DATA RETRY AFTER CRC ERROR
08	TAPE READ OPERATION COMPLETE, TERMINATED BY FILE MARK
13	DRIVE SEEKING
18	REWIND;POSITION COMMAND IN PROGRESS
19	ERASE TAPE;POSITION COMMAND IN PROGRESS
1A	RETENSION;POSITION COMMAND IN PROGRESS
1B	ADVANCE FILE MARK; POSITION COMMAND IN PROGRESS
1C	TRANSPARENT BACKUP IN PROGRESS
1D	TRANSPARENT RESTORE IN PROGRESS
20	DISK DRIVE NOT PRESENT

21	SEEK FAULT
22	CYLINDER MISMATCH ERROR
23	SECTOR NOT FOUND
24	ID CHECKSUM ERROR
25	DATA CRC ERROR
28	DISK WRITE PROTECTED
30	INVALID CONTROLLER COMMAND
31	INVALID DISK DRIVE
32	INVALID HEAD
33	INVALID CYLINDER
34	INVALID SECTOR
36	INVALID DRIVE ID
37	INVALID SECTOR SIZE (OTHER THAN 128,256, OR 512)
38	DISK OVERRUN (MAX CYLINDER)
40	BAD SECTOR DETECTED BY CRC VERIFY ROUTINE
41	DEFECT EXISTS
42	DEFECT MAP FULL
43	NO DEFECT MAP
44	NO SPACE FOR ALTERNATE
45	DEFECT NOT FOUND
60	TAPE DRIVE NOT PRESENT
61	TAPE CARTRIDGE WRITE PROTECTED
62	FILE MARK DETECTED
63	BLOCK IN ERROR NOT FOUND
65	HARD DATA ERROR
68	CARTRIDGE NOT IN PLACE
69	END OF TAPE
6A	TAPE NOT ONLINE
6B	TAPE RESET OCCURRED
6C	BEGINNING OF TAPE
6D	NO DATA DETECTED
6E	ILLEGAL COMMAND (TO TAPE DRIVE FROM CONTROLLER)
70	INVALID COMMAND WITH TAPE WRITE MODE SET
71	INVALID COMMAND WITH TAPE READ MODE SET
73	TAPE NOT AVAILABLE (CURRENTLY BEING USED IN XPARENTCOM)

80	CONTROLLER RESET HAS OCCURRED
F0	NO COMMAND; AWAITING ACKNOWLEDGEMENT
F4	TRANSPARENT COMMAND NOT COMPLETE
F8	NO TRANSPARENT COMMAND IN PROGRESS

B.2.2 Device Error Subcodes

When a device dependent error occurs, a subcode is displayed whose interpretation depends on the device type. This code is displayed in hexadecimal.

Each subcode is a single byte whose bits represent various conditions, and several bits may be on simultaneously, so that their sum represents the total subcode. Not all bits indicate errors; some are simply status information. A device error subcode of 0 indicates no subcode is given for the device causing the error.

A conversion table for decimal, hexadecimal, and binary numbers appears in a separate appendix.

B.2.2.1 Hard Disk Device Subcodes

Floor-Standing File Server

VALUE NAME AND DESCRIPTION

$01 Ready

The drive is up to speed, servo system is locked onto a servo track, and the unit is in a state to read, write or seek.

$02 Seek Complete

The bit is set when seek operation is completed.

$04 Seek Fault

This bit indicates that a fault was detected during a seek operation.

$08 Cylinder Zero

The access arm is positioned over cylinder 0.

$10 Busy

The drive is in the process of executing a command.

$20 Drive Fault

A fault was detected by the drive error monitoring circuitry.

$40 Write Protect

The drive selected is write protected. Write protection is set by switches in the drive or when the drive is not sequenced up.

$80 Command Reject

A control or Register Load Command was received while the drive was not ready, or an undefined command was received.

Desktop File Server

VALUE	NAME AND DESCRIPTION
$01	**Reserved for disk/tape controller**
$02	**Reserved for disk/tape controller**
$04	**Reserved for disk/tape controller**
$08	**Reserved for disk/tape controller**

$10 Drive Fault

A fault was detected by the drive error monitoring circuitry

$20 Seek Complete

The bit is set when seek operation is completed.

$40 Cylinder Zero

The access arm is positioned over cylinder 0.

$80 Ready

The drive is up to speed, servo system is locked onto a servo track, and the unit is in a state to read, write or seek.

B.3 Errors while Booting the File Server

B.3.1 Errors while Booting from Hard Disk

If a hardware error occurs during boot, an attempt is made to diagnose the problem and report it. The following table is a list of the messages and their meaning.

Disk drive not attached to PIC.

Indicates the Peripheral Interface Card (usually in slot 3 of the card cage) is not communicating with the controller. Possible causes are a damaged PIC, cable or disk controller.

Drive Error when identifying drive. Code is $xx.

A hard disk error occurred while accessing the boot drive. See Section A.2.1 for list of the error codes and their meanings.

$36 indicates that the drive is unformatted.

Drive Error while reading boot volume. Code is $xx.

A hard disk error (error code xx) occurred while reading the boot volume //SYSTEM/FILESERVER. See Section A.2.1 for a list of the error codes and their meanings.

PIC missing or not working.

Indicates the file server could not access the PIC (usually in slot 3 of the card cage). The PIC is not present in the machine or is not working.

Disk sector 0 is not initialized.

The disk does not have a directory structure placed upon it. Indicates corruption of the disk structure.

Disk boot volume pointer not set

Indicates there is no boot volume set for this drive.

All errors that occur while booting from the hard disk are serious and should be reported to your service representative immediately.

B.3.2 Errors while Booting from Server Diagnostic Tape

If a hardware error occurs during the boot process, an attempt is made to diagnose the problem and to report it. The following is a list of the messages and their meanings.

Tape is not a Server Diagnostic tape.

Indicates a tape of the wrong type was inserted in the drive. Only diagnostic boot tapes, not backup tapes, can be used to boot the server.

Version of the Diagnostic tape must be Version 2.0 or later.

Indicates an attempt was made to boot from a tape older than the boot ROM.

Checksum error on Diagnostic tape.

Indicates an error while reading tape. Possible causes are a damaged tape or a defective drive or controller.

Error during tape read. Result is $xx.

Indicates an error occurred while reading the boot tape. See Section A.2.1 for a list of the error codes.

B.4 System Errors

If the file server detects a run-time error,

```
***** SYSTEM ERROR *****
error type _____
System stack is: iiii jjjjjjjj kkkk mmmm nnnnnnnn
Hit return to reboot server...
```

will be displayed, where error type is a message describing the error.

If this should happen, you should contact your network service representative immediately. You should also record the full contents of the file server's console (for your service representative's use). Then reboot the file server and check the consistency of the disk (see the File Server Installation and Operation Manual, Section 4.9) before allowing the file server software to execute.

B.5 Error and Information Messages

When the file server receives a file server command from a user station, it executes the command, if possible, and, in any case, returns two variables:

- return code (an integer between 0 and 300)

- return message, such as OK, ILLEGAL COMMAND, or TYPE=PASCAL

Messages are of several types:

- information, such as OK, IN USE, TYPE=BINARY

- user errors such as syntax errors or attempting to access a Network file without the necessary access rights

- system errors such as memory full or disk full; these should be reported to the system manager.

In this list, messages are classified as:

general syntax

pertaining to a specific command

system errors

file system errors.

General Syntax (0–19)

0,OK

(Not an error.) The command was syntactically correct and was executed without error.

1,ILLEGAL COMMAND

The command verb cannot be recognized, or cannot be executed from this user station operating system environment. The command verb is the first word of the command, and must be separated from the rest of the command with one or more blanks.

2,NAME PARAMETER REQUIRED

The first parameter of the command must be a non-null pathname or lockname.

3,UNRECOGNIZED PARAMETER

A keyword parameter was not recognized. Check the spelling carefully, and make sure that it is properly separated from the previous and following items with commas.

4,ILLEGAL DRIVE IDENTIFIER

In all environments except PC DOS 2.0, a drive ID must be specified with "D" followed by an integer in the range supported for your environment. Example: "D4". For PC DOS 2.0, the drive identifier should be in the range "A:" to "Z:".

5,ILLEGAL STATION NUMBER

A station number must be specified as a two-digit hexadecimal number preceeded with $, in the range $01 to $FE. Example: "$2D".

6,MISSING PROTECTION PARAMETER

A PROTECT command has been issued without at least one of the following keyword parameters: PRVPW, GRPPW, PRVACC, GRPACC, PUBACC.

7,PARAMETER APPEARS TWICE

A keyword parameter appears more than once in a single command. There can only be one occurrence of each keyword parameter, even if multiple occurrences have the same value.

8,ILLEGAL TYPE PARAMETER

The "T=" value is not one of the legal volume types. It must be one of the following:

P (Apple // Pascal) B (binary)
D (Apple // DOS) S (system)
C (Apple // CP/M) Y (directory)
3 (Apple /// SOS) T (text)
U (IBM PC p-SYSTEM PASCAL) I (IBM PC DOS)
R (server request) X (user defined)

Example: T=P

9,COMMAND TOO LONG

A file server command must be no longer than 80 characters. In unusual cases where this is a problem, long commands can often be shortened by using a default directory, or by assigning access rights in a subsequent PROTECT command.

10,PARAMETER TOO LONG

The new name given as the second parameter of the RENAME command, the password, or the INIT VOLNAME parameter must be no more than 15 characters long. Remember that RENAME changes only the last name in the sequence of names which constitute a pathname. If you wish to change the name of a directory, give the pathname of the directory itself as the first parameter of RENAME.

11,ILLEGAL PROTECTION PARAMETER

The value of the PUBACC, GRPACC, or PRVACC protection item is incorrect. The value must be some combination of the letters RWECDX (read, write, erase, create, delete and execute), or may be null. For example, "GRPACC=RW" or "PUBACC=".

13,NUMBER OUT OF RANGE

The number was less than -(2 ^ 31) or bigger than (2 ^ 31)-1. Number may be specified in decimal, or in hexadecimal preceeded by $. Examples: "42", "$1A3".

19,HELP FILE NOT FOUND

There is no HELP file for the word used as an operand of the HELP command. Use the HELP command without any parameters to see what the possible HELP parameters are. (The system manager has the option of removing all HELP files to save space.)

Create (20-25)

20,TYPE PARAMETER REQUIRED (T=)

The type parameter was missing. Example:"T=D".

21,SIZE OUT OF RANGE

The legal SIZE ranges are:

Type	Min (blocks)	Max (blocks)
Y	1	32
S	1	contiguous free space
D	0	16383
All others	0	contiguous free space

Each block is 512 bytes. Other units that can be specified are C (characters), and K (1024 bytes). If the units are omitted, B (512-byte blocks) is assumed (one block = two sectors).

Examples: "SIZE=280", "SIZE=2000S".

23,SIZE PARAMETER REQUIRED WITH T=B

The SIZE or LENGTH parameter must be specified to create a binary volume. The size may be an overestimate of the size of the data to be BSAVEd into the volume, but it must not be less.

Delete (27-29)

29,CURRENTLY MOUNTED OR DEFAULT DIR

You cannot delete a volume which is currently mounted by any station, or which is the default directory (see the SET DIR command) of any station.

Mount (30-34)

30,DRIVE REQUIRED

You must specify what drive the volume is to be mounted on. Example: "D4".

31,IN USE

The volume you asked to mount is in use by another station. You are therefore denied Exclusive or Update use of that volume.

32,IN EXC USE

The volume you asked to mount is in exclusive use by another station. You are therefore denied any use of the volume.

33,VOLUME NOT INITIALIZED

An attempt was made to mount a volume that was not created using a file server CREATE command.

34,RW NOT ALLOWED ON DIRECTORIES

You are not allowed to mount a directory (T=Y) volume for write access.

Unmount/Remount (35-39)

35,DRIVE OR "ALL" REQUIRED

You must specify a drive number or "ALL" on the UNMOUNT or REMOUNT command. Examples: "UNMOUNT D1", "UNMOUNT ALL".

36,NOT CURRENTLY MOUNTED

The drive number specified in the UNMOUNT or REMOUNT command does not have a virtual volume mounted on it by the file server.

Lock/Unlock (40-49)

40,ILLEGAL LOCK NAME

A lock name must be 1 to 15 characters long.

41,IN USE

The lock name specified is in use by another station. You are therefore denied exclusive use of the lock.

42,IN EXC USE

The lock name specified is in exclusive use by another station. You are therefore denied any use of the lock.

43,<lock value>

(Not an error.) READLOCK, WRITELOCK, LOCK+ AND LOCK- commands return the previous lock value.

44,LOCK VALUE OUT OF RANGE

The result of a LOCK+ or LOCK- command can not be expressed as a 32 bit integer.

45,LOCK NOT HELD

The lock name specified is not currently held by your station.

46,LOCK HELD BY MAXIMUM USERS

LOCK command failed because current number of lock holders equals the limit set by USERS parameter in the original LOCK command.

47,LOCK/UNLOCK REQUIRES PASSWORD

Returned if the proper password is not used with a LOCK or UNLOCK command on a lock with password set.

48,MISSING VAL PARAMETER

The WRITELOCK commmand requires a VAL=<integer> parameter to set the value of the lock.

BSAVE, BRUN, BLOAD (50-55)

50,BRUN ATTEMPT TO WRONG ENVIRONMENT

A BRUN command has been issued for a volume originally BSAVEd or CREATEd on a different type of computer (not allowed).

51,NOT BINARY

The pathname indentifies a volume which is not binary (T=B). Only binary volumes can be used for BSAVE, BLOAD, or BRUN commands.

53,FROM PARAMETER REQUIRED

For BSAVE, the FROM parameter, which specifies the memory area from which data is to be taken, must be provided. Example: "FROM=$1000".

54,SIZE OR LENGTH PARAMETER REQUIRED

For BSAVE, you must provide the SIZE or LENGTH parameter on the BSAVE command to indicate how much data is to be saved. This value must be less than or equal to the size of the volume specified on the original CREATE command. Example: "SIZE=256.C".

55,LENGTH/SIZE PARAMETER MISMATCH

The number of characters represented by the LENGTH parameter is too large for the size of the file represented by the SIZE parameter. You must either decrease LENGTH or increase SIZE.

SET/LIST (56-58)

57,FILE IS NOT A DIRECTORY

The pathname given in a SET DIR command identifies a volume which is not a directory (T=Y).

58,USE: SET TIME [YYMMDD][,HH[MM]]

If the date parameter was supplied, it was incomplete or contained invalid fields. If the time of day parameter was supplied, it contained invalid fields.

SHOW (59-80)

59,TYPE=SYSTEM

(Not an error.) The volume mounted on the drive for which you did a "SHOW TYPE" is a system volume (T=S).

60,SHOW OPTION NOT RECOGNIZED

The operand of a "SHOW" command was not recognized. Check the spelling and make sure there are no extraneous items in the command.

61,DRIVE REQUIRED

For the "SHOW TYPE" command you must specify the drive number on which the volume is mounted. Example: "SHOW TYPE D12".

62,NOT CURRENTLY MOUNTED

The drive number specified has no volume mounted on it by the file server.

63,TYPE=APPLE // CP/M

(Not an error.) The volume mounted on the drive for which you did a "SHOW TYPE" is an Apple // CP/M volume. (T=C).

64,NO DEFAULT DIRECTORY SET

(Not necessarily an error.) This response to the "SHOW DIR" command indicates that there is no default directory established for this station by the file server.

65,TYPE=APPLE // PASCAL

(Not an error.) The volume mounted on the drive for which you did a "SHOW TYPE" is an Apple // Pascal volume (T=P).

66,TYPE=APPLE // DOS

(Not an error.) The volume mounted on the drive for which you did a "SHOW TYPE" is an Apple // DOS volume (T=D).

67,TYPE=BINARY

(Not an error.) The volume mounted on the drive for which you did a "SHOW TYPE" is a binary volume (T=B).

68,TYPE=DIRECTORY

(Not an error.) The volume mounted on the drive for which you did a "SHOW TYPE" is a directory (T=Y).

69,UNKNOWN TYPE

The volume mounted on the drive for which you did a "SHOW TYPE" is not a standard volume type.

70,yymmddhhmmssw

(Not an error.) Returns date and time information in encoded form. For example, the FS command TIMESTAMP returns the current year, month, day, hour, minute, second, and day of the week in the form 70,8104301859381 (that is, 6:59 P.M., Sunday, April 30, 1981).

71,--t--tt--t-t----

(Not an error.) Returns types of virtual disks currently mounted on drives 1-16 (Y,P,D,B,S,C,3,I,U,T). The system responds to the FS command SHOW TYPES using this format.

72,FS=$nn,SFS=$nn,T=<type>,<access>,<usage>,
SIZE=<size>,PS=<status>,PE=<primary IOB error code>,
SS=<status>,SE=<secondary IOB error code>

This is the response to the user inquiry "?<drive>" (in some environments); used primarily by programmers. $nn is the station address in hexadecimal of the current primary file server (FS) and the secondary file server (SFS). <type> is the type of volume currently mounted on drive d, with <access> and <usage> set. <size> is the size of the volume in blocks, given in the format nnnn.B. The <status> values are the current usage status set for the drive for the primary and secondary file servers.

Example

72,FS=$FE,T=I,RO,SHR,SIZE=1000.B,PS=RW,PE=0,
SS=RO,SE=0

Here, the current file server is $FE. The volume on the specified drive is of type I, mounted for Read/Only Shared usage. Size of the volume is 1000 512-byte blocks. Status of the primary file server is set to read/write from the primary and no error occurred on the last operation (PE=00). Status of the secondary file server is set to read/only and no error occurred on the last operation.

73,TYPE=TEXT

(Not an error.) The volume mounted on the drive for which you did the SHOW TYPE is a text volume (T=T).

74,TYPE=APPLE /// SOS

(Not an error.) The volume mounted on the drive for which you did the SHOW TYPE is an Apple /// SOS volume (T=3).

75,TYPE=IBM PC DOS

(Not an error.) The volume mounted on the drive for which you did the SHOW TYPE is an IBM PC DOS volume (T=I).

76,TYPE=IBM PC P-SYSTEM PASCAL

(Not an error.) The volume mounted on the drive for which you did a "SHOW TYPE" is an IBM PC p-System Pascal volume (T=U).

77,TYPE=REQUEST

(Not an error.) The volume mounted on the drive for which you did a "SHOW TYPE" is a Nestar Request format volume (T=R).

78,TYPE=USER DEFINED

(Not an error.) The volume mounted on the drive for which you did a "SHOW TYPE" has no Nestar specified contents (T=X).

79,FS CMD CHANNEL IS STN $nn

Response to the user drive inquiry "?@" (some environments). Gives current default file server for NET commands.

80,DAY DD-MON-YYYY HH:MM:SS

(Not an error.) This is the response to the SHOW TIME command.

Local Messages (89-99)

89,Station not found

The station that the file server was set to (using the SET FS command) does not exist on the network.

90,Drive identifier(s) required

A drive number, or list of drive numbers, is required for this command. Example: "SET DRIVES 4,5 VIRTUAL".

91,Drive number not allowed

There are 12 drives (also called "volumes") in Pascal, but only some of them can be made virtual with the SET DRIVE local command. In Apple][Pascal Version 1.1, drives 3 through 12 are valid.

92,No drive information

Response to the user drive inquiry "?L" (some environments) when no volume is mounted on the specified drive.

93,Drive not virtual

Response to the user drive inquiry "?L" (some environments) when the drive is real.

System Errors (94-99)

94,FILE SERVER COMMAND NOT ISSUED

This is a network error that indicates that the connection to another station has been terminated prematurely.

95,UNRECOGNIZABLE NETWORK RESPONSE

The last response message from file server did not contain a numeric error code, as expected. This may indicate incorrect logic in the use of NETUNIT procedures from within Pascal programs.

96,NO NETWORK CARD IN SLOT

The slot number specified does not have a Nestar network interface card installed, or the card is defective (some environments).

97,FILE SERVER MEMORY FULL

The file server has no space left for tables needed to complete your request. This does NOT refer to memory space in the user station.

98,NETWORK TIMEOUT

The network routines were unable to complete the transaction. The error may be transient; see the description of NETUNIT for more information. This error does not occur from most user level programs, such as NET.

99,USER ABORT

The network abort key was pressed while a network transaction was queued up or in progress. The transaction was aborted.

File System Errors (100–140)

101,END OF FILE OR RECORD OUT OF RANGE

An attempt was made to read a block or sector of a volume which is outside the legal range for that volume.

102,FILE NOT FOUND

The volume specified by the pathname was not found, or one of the directories in the pathname was not found. Check the spelling of each filename in the pathname. If the name does not begin with a slash, check that the current default directory is the correct one.

103,BAD DELIMITER IN PATHNAME

A delimiter other than "/" or ":" was found in a pathname. Make sure that you have not omitted a comma separating the pathname from other operands in the command.

104,FILENAME OR PASSWORD TOO BIG

A single filename (the part between slashes in a pathname), or a password (the part after a colon in a pathname) is longer than the maximum of 15 characters.

105,NO ACCESS FOR READ TO DIRECTORY

You have been denied read access to a directory which is part of the specified pathname.

106,NON DIRECTORY FOUND IN PATHNAME

One of the names in the pathname (other than the last name) identifies a volume which is not a directory (T=Y). Only the last thing in a pathname can be other than a directory.

107,END OF PATHNAME IS A DIRECTORY

The pathname specifies a directory (T=Y) in a context where a non-directory volume is required.

108,CAN'T MOVE FROM ONE UNIT TO ANOTHER

A MOVE command was attempted between pathnames on two different units (e.g., MOVE /ALT/TEMP, /MAIN/USERS/XY/TEMP). The new pathname must have the same unit name as the old pathname.

109,ROOT DIR NOT SPECIFIED NO DEFAULT

The specified pathname does not begin with a slash, and there is no default directory recorded for this station by the file server. If you wish to completely specify the pathname, begin with a slash and the name or number

of the disk unit. If you wish to use the current default directory, do not begin the pathname with a slash. You may use the "SHOW DIR" command to find out the current default directory, and the "SET DIR" command to establish one.

110,NO ACCESS FOR READ

You have been denied read access to the volume specified by the pathname, or to a directory along the path.

111,NO ACCESS FOR WRITE

You have been denied write access to the volume specified by the pathname.

112,NO ACCESS FOR APPEND (not yet implemented)

You have been denied append access to the volume specified by the pathname.

113,NO ACCESS FOR ERASE

You have been denied erase access to the volume specified by the pathname. Erase access is necessary to delete the file.

114,NO ACCESS FOR CREATE

You have been denied access to create or rename an entry in one of the directories specified in the pathname.

115,NO ACCESS FOR DELETE

You have been denied access to delete or rename an entry in one of the directories specified in the pathname.

116,CANT DELETE NON-EMPTY DIRECTORY

The pathname specified in a DELETE command identifies a directory, and that directory is not empty, that is, it still points to other volumes. Only empty directories can be deleted by a single file server DELETE command. To delete non-empty directories (i.e. subtrees) see the description of the TREEWALK utility in the User's Manual for supported environments.

117,FILE SERVER MEMORY FULL

The file server has no space left for tables needed to complete your request. This does NOT refer to memory space in the user station.

118,DISK FULL

There is not enough contiguous space left on the disk unit to create the volume. The LIST command when used to display the root directory will give information about the space available on a disk unit. Example: "LIST /MAIN".

119,DIR OR VOL FULL - CANT BE EXTENDED

Applies to directories and extendible volumes: maximum number of entries for the directory has been reached, or a volume has been extended to its maximum size.

120,INTERNAL ERROR

An internal error has been detected by the file server. Additional information is written on the console of the file server. That information and the circumstances surrounding the error should be transmitted to your support organization for diagnosis. The file server should be restarted as soon as practical.

121,UNINITIALIZED DISK

The disk unit has not been initialized. All disks must be formatted and initialized using the file server FORMAT DISK utility; see the File Server Installation and Operation Manual.

122,WRONG SOFTWARE VERSION

The disk format is not compatible with version of the file server currently running. Contact your support representative.

123,FILE ALREADY EXISTS

The file you have asked to create, or the new name used in a RENAME or MOVE command, already exists in the directory.

124,DISK I/O ERROR CODE X SUBCODE Y AT SECTOR Z

A hardware I/O error was detected. The details of the error are described in the subcodes; for more information, see the table of I/O errors in Appendix A of the File Server Installation and Operation Manual.

125,VERIFY FAILED (BAD MEMORY)

All disk write operations are verified by reading back the recorded data and comparing it to the data stored in memory. This error indicates that the disk data did not compare correctly. It sometimes indicates a memory error in the file server, and not a disk error.

128,BAD UNIT NUMBER IN PATHNAME

The first item after the initial slash in a pathname is a number, but it is not in the legal range for unit numbers (1 to 4).

130,NEED PRIVATE PASSWORD FOR PROTECT

In order to execute the PROTECT command for any volume, the private password must be specified in the pathname or as a default private password. The password must be specified whenever the volume has a non-null private password, regardless of the access rights currently assigned to the volume.

131,UNIT NAME NOT FOUND

The name after the initial slash of a pathname is not the name of a disk unit currently recognized by the file server. You can also use the unit number in place of a name, if you wish.

132,CANT LINK TO DIRECTORY

An attempt was made to link to a directory (e.g., LINK /MAIN/PROGRAMS/1, /MAIN/USERS). Links can be made to any type of virtual volume except type Y.

133,DISK NOT READY

The disk unit specified is not ready. The one minute warmup period after initial power up may not have elapsed. It may also indicate a controller or disk drive failure.

135,OUT OF FREESPACE DESCRIPTORS

This message indicates that the unused space on the disk has become very highly fragmented. Call your customer service representative.

Local Commands (200-250)

200,Responses different

The response codes returned by the primary file server and the secondary file server are different. The two response lines that precede this error on the screen are those returned by the primary file server and secondary file server.

201,Missing or illegal read/write code

The read/write code in the !d command is not of the correct format.

202,SFS=$nn

The secondary file server for the command channel is station $nn.

203,Primary FS cannot be same as secondary FS

An attempt was made to set the secondary file server to be the same as the primary.

204,Secondary volume is not the same as primary

An attempt was made to mount a volume on the secondary file server that is not identical to the volume on the primary file server. The volumes must have identical type, size, usage and directory entries.

210,DOS I/0 error

A DOS error occurred while INITing a volume. Retry the INIT command.

211,Entries invalid with SYS option

When initializing an IBM PC DOS 2.0 bootable virtual volume, the ENTRIES parameter cannot be used when the SYS option is specified.

Appendix C

Address Shunts on the NIC and PIC

Each workstation and server on the network requires a network interface card or "NIC" (file server NICs are also called Peripheral Interface Cards, or "PICs"). Every NIC contains an 8-position device called an "address shunt", which, when properly set, gives the NIC and its station a unique address on the network.

Each station MUST have a unique address programmed on its NIC address shunt. This section describes how to set the NIC address shunts for network stations.

Addresses are set by breaking shunt wires to create a binary number. A broken shunt signifies a binary digit one and a closed shunt signifies a binary digit zero. All user station cards are shipped with all shunts intact and therefore have address $00 (the '$' signifies hexadecimal). Addresses from 1 to $FF are available for use by user stations.

WARNING: turn off computer before inserting or removing card!

To match NICs to the correct type of microcomputers (if your network contains more than one type), see Chapter 5.

For Apple // and /// cards: when holding the card in your hand with the edge connector at the upper right, the shunts are read as follows:

```
bit      7 6 5 4 3 2 1 0
most significant        least significant
```

where bit 0 is closest to the bottom of the board and bit 7 is at the top. Some NICs have the letters "LSB" and "MSB" on them, to indicate least-significant and

most-significant bits.

For IBM PC interface cards, bit 0 and bit 7 are indicated by the numbers 0 and 7 on the board. Some NICs have the letters "LSB" and "MSB" on them, to indicate least-significant and most-significant bits.

For file server controller PIC cards, 0 (least significant) and 7 (most significant) are indicated by the letters LS and MS on the board.

WARNING: If any stations have address $00, the network will not work. All stations must use NICs with non-zero station addresses (at least one shunt broken).

Addresses are programmed by breaking the shunts where a one is desired, using a small sharp tool (a standard office push pin works quite well). For example, if shunts 2,4 and 5 are broken on a user station card, its address would be 00110100 (binary) or $34 (hex).

A conversion table for decimal, hexadecimal, and binary numbers appears in a separate appendix. In the conversion table, a binary "1" corresponds to a broken shunt.

The first file server must be labeled $FE; it is suggested that subsequent file servers be labeled $FD, $FC, etc. Other stations must be set to unique numbers in the range 1 to $FD (253).

It is suggested that the numbering begin with 1, that labels be placed on the cards to indicate station number, and that a record be kept of user station locations and numbers. Having more than one station on the network (or on connected networks) with the same address will cause no physical damage, but will result in a variety of network and file server problems that may be difficult to diagnose.

Warning: duplicate addresses can cause problems that vary according to otherwise innocuous configuration parameters, such as

- Length of cables
- Configuration of active HUBs
- Use of passive HUBs
- Workstation signals sent simultaneously to a server

Occasionally, defective shunts are encountered, in which some shunt wires that appear to be unbroken, in fact make only an intermittent connection. With such a shunt, the workstation appears to switch from one address to another.

When a workstation loses mounts at a file server, communicates only intermittently with a file server, or runs too slowly, check the station's address using the NET or COUNT utilities, or a file server utility.

Appendix D

Decimal/Hexadecimal/Binary Conversion

DECIMAL	HEXADECIMAL	BINARY BIT							
		7	6	5	4	3	2	1	0
1	$01	0	0	0	0	0	0	0	1
2	$02	0	0	0	0	0	0	1	0
3	$03	0	0	0	0	0	0	1	1
4	$04	0	0	0	0	0	1	0	0
5	$05	0	0	0	0	0	1	0	1
6	$06	0	0	0	0	0	1	1	0
7	$07	0	0	0	0	0	1	1	1
8	$08	0	0	0	0	1	0	0	0
9	$09	0	0	0	0	1	0	0	1
10	$0A	0	0	0	0	1	0	1	0
11	$0B	0	0	0	0	1	0	1	1
12	$0C	0	0	0	0	1	1	0	0
13	$0D	0	0	0	0	1	1	0	1
14	$0E	0	0	0	0	1	1	1	0
15	$0F	0	0	0	0	1	1	1	1
16	$10	0	0	0	1	0	0	0	0
17	$11	0	0	0	1	0	0	0	1
18	$12	0	0	0	1	0	0	1	0
19	$12	0	0	0	1	0	0	1	1
20	$14	0	0	0	1	0	1	0	0
21	$15	0	0	0	1	0	1	0	1
22	$16	0	0	0	1	0	1	1	0
23	$17	0	0	0	1	0	1	1	1
24	$18	0	0	0	1	1	0	0	0
25	$19	0	0	0	1	1	0	0	1
26	$1A	0	0	0	1	1	0	1	0
27	$1B	0	0	0	1	1	0	1	1
28	$1C	0	0	0	1	1	1	0	0
29	$1D	0	0	0	1	1	1	0	1
30	$1E	0	0	0	1	1	1	1	0
31	$1F	0	0	0	1	1	1	1	1
32	$20	0	0	1	0	0	0	0	0

DECIMAL	HEXADECIMAL	BINARY BIT							
		7	6	5	4	3	2	1	0
33	$21	0	0	1	0	0	0	0	1
34	$22	0	0	1	0	0	0	1	0
35	$23	0	0	1	0	0	0	1	1
36	$24	0	0	1	0	0	1	0	0
37	$25	0	0	1	0	0	1	0	1
38	$26	0	0	1	0	0	1	1	0
39	$27	0	0	1	0	0	1	1	1
40	$28	0	0	1	0	1	0	0	0
41	$29	0	0	1	0	1	0	0	1
42	$2A	0	0	1	0	1	0	1	0
43	$2B	0	0	1	0	1	0	1	1
44	$2C	0	0	1	0	1	1	0	0
45	$2D	0	0	1	0	1	1	0	1
46	$2E	0	0	1	0	1	1	1	0
47	$2F	0	0	1	0	1	1	1	1
48	$30	0	0	1	1	0	0	0	0
49	$31	0	0	1	1	0	0	0	1
50	$32	0	0	1	1	0	0	1	0
51	$33	0	0	1	1	0	0	1	1
52	$34	0	0	1	1	0	1	0	0
53	$35	0	0	1	1	0	1	0	1
54	$36	0	0	1	1	0	1	1	0
55	$37	0	0	1	1	0	1	1	1
56	$38	0	0	1	1	1	0	0	0
57	$39	0	0	1	1	1	0	0	1
58	$3A	0	0	1	1	1	0	1	0
59	$3B	0	0	1	1	1	0	1	1
60	$3C	0	0	1	1	1	1	0	0
61	$3D	0	0	1	1	1	1	0	1
62	$3E	0	0	1	1	1	1	1	0
63	$3F	0	0	1	1	1	1	1	1
64	$40	0	1	0	0	0	0	0	0
65	$41	0	1	0	0	0	0	0	1
66	$42	0	1	0	0	0	0	1	0
67	$43	0	1	0	0	0	0	1	1
68	$44	0	1	0	0	0	1	0	0
69	$45	0	1	0	0	0	1	0	1

DECIMAL	HEXADECIMAL	BINARY BIT							
		7	6	5	4	3	2	1	0
70	$46	0	1	0	0	0	1	1	0
71	$47	0	1	0	0	0	1	1	1
72	$48	0	1	0	0	1	0	0	0
73	$49	0	1	0	0	1	0	0	1
74	$4A	0	1	0	0	1	0	1	0
75	$4B	0	1	0	0	1	0	1	1
76	$4C	0	1	0	0	1	1	0	0
77	$4D	0	1	0	0	1	1	0	1
78	$4E	0	1	0	0	1	1	1	0
79	$4F	0	1	0	0	1	1	1	1
80	$50	0	1	0	1	0	0	0	0
81	$51	0	1	0	1	0	0	0	1
82	$52	0	1	0	1	0	0	1	0
83	$53	0	1	0	1	0	0	1	1
84	$54	0	1	0	1	0	1	0	0
85	$55	0	1	0	1	0	1	0	1
86	$56	0	1	0	1	0	1	1	0
87	$57	0	1	0	1	0	1	1	1
88	$58	0	1	0	1	1	0	0	0
89	$59	0	1	0	1	1	0	0	1
90	$5A	0	1	0	1	1	0	1	0
91	$5B	0	1	0	1	1	0	1	1
92	$5C	0	1	0	1	1	1	0	0
93	$5D	0	1	0	1	1	1	0	1
94	$5E	0	1	0	1	1	1	1	0
95	$5F	0	1	0	1	1	1	1	1
96	$60	0	1	1	0	0	0	0	0
97	$61	0	1	1	0	0	0	0	1
98	$62	0	1	1	0	0	0	1	0
99	$63	0	1	1	0	0	0	1	1
100	$64	0	1	1	0	0	1	0	0
101	$65	0	1	1	0	0	1	0	1
102	$66	0	1	1	0	0	1	1	0
103	$67	0	1	1	0	0	1	1	1
104	$68	0	1	1	0	1	0	0	0
105	$69	0	1	1	0	1	0	0	1
106	$6A	0	1	1	0	1	0	1	0

DECIMAL	HEXADECIMAL	BINARY BIT							
		7	6	5	4	3	2	1	0
107	$6B	0	1	1	0	1	0	1	1
108	$6C	0	1	1	0	1	1	0	0
109	$6D	0	1	1	0	1	1	0	1
110	$6E	0	1	1	0	1	1	1	0
111	$6F	0	1	1	0	1	1	1	1
112	$70	0	1	1	1	0	0	0	0
113	$71	0	1	1	1	0	0	0	1
114	$72	0	1	1	1	0	0	1	0
115	$73	0	1	1	1	0	0	1	1
116	$74	0	1	1	1	0	1	0	0
117	$75	0	1	1	1	0	1	0	1
118	$76	0	1	1	1	0	1	1	0
119	$77	0	1	1	1	0	1	1	1
120	$78	0	1	1	1	1	0	0	0
121	$79	0	1	1	1	1	0	0	1
122	$7A	0	1	1	1	1	0	1	0
123	$7B	0	1	1	1	1	0	1	1
124	$7C	0	1	1	1	1	1	0	0
125	$7D	0	1	1	1	1	1	0	1
126	$7E	0	1	1	1	1	1	1	0
127	$7F	0	1	1	1	1	1	1	1
128	$80	1	0	0	0	0	0	0	0
129	$81	1	0	0	0	0	0	0	1
130	$82	1	0	0	0	0	0	1	0
131	$83	1	0	0	0	0	0	1	1
132	$84	1	0	0	0	0	1	0	0
133	$85	1	0	0	0	0	1	0	1
134	$86	1	0	0	0	0	1	1	0
135	$87	1	0	0	0	0	1	1	1
136	$88	1	0	0	0	1	0	0	0
137	$89	1	0	0	0	1	0	0	1
138	$8A	1	0	0	0	1	0	1	0
139	$8B	1	0	0	0	1	0	1	1
140	$8C	1	0	0	0	1	1	0	0
141	$8D	1	0	0	0	1	1	0	1
142	$8E	1	0	0	0	1	1	1	0
143	$8F	1	0	0	0	1	1	1	1

DECIMAL	HEXADECIMAL	BINARY BIT							
		7	6	5	4	3	2	1	0
144	$90	1	0	0	1	0	0	0	0
145	$91	1	0	0	1	0	0	0	1
146	$92	1	0	0	1	0	0	1	0
147	$93	1	0	0	1	0	0	1	1
148	$94	1	0	0	1	0	1	0	0
149	$95	1	0	0	1	0	1	0	1
150	$96	1	0	0	1	0	1	1	0
151	$97	1	0	0	1	0	1	1	1
152	$98	1	0	0	1	1	0	0	0
153	$99	1	0	0	1	1	0	0	1
154	$9A	1	0	0	1	1	0	1	0
155	$9B	1	0	0	1	1	0	1	1
156	$9C	1	0	0	1	1	1	0	0
157	$9D	1	0	0	1	1	1	0	1
158	$9E	1	0	0	1	1	1	1	0
159	$9F	1	0	0	1	1	1	1	1
160	$A0	1	0	1	0	0	0	0	0
161	$A1	1	0	1	0	0	0	0	1
162	$A2	1	0	1	0	0	0	1	0
163	$A3	1	0	1	0	0	0	1	1
164	$A4	1	0	1	0	0	1	0	0
165	$A5	1	0	1	0	0	1	0	1
166	$A6	1	0	1	0	0	1	1	0
167	$A7	1	0	1	0	0	1	1	1
168	$A8	1	0	1	0	1	0	0	0
169	$A9	1	0	1	0	1	0	0	1
170	$AA	1	0	1	0	1	0	1	0
171	$AB	1	0	1	0	1	0	1	1
172	$AC	1	0	1	0	1	1	0	0
173	$AD	1	0	1	0	1	1	0	1
174	$AE	1	0	1	0	1	1	1	0
175	$AF	1	0	1	0	1	1	1	1
176	$B0	1	0	1	1	0	0	0	0
177	$B1	1	0	1	1	0	0	0	1
178	$B2	1	0	1	1	0	0	1	0
179	$B3	1	0	1	1	0	0	1	1
180	$B4	1	0	1	1	0	1	0	0

DECIMAL	HEXADECIMAL	BINARY BIT							
		7	6	5	4	3	2	1	0
181	$B5	1	0	1	1	0	1	0	1
182	$B6	1	0	1	1	0	1	1	0
183	$B7	1	0	1	1	0	1	1	1
184	$B8	1	0	1	1	1	0	0	0
185	$B9	1	0	1	1	1	0	0	1
186	$BA	1	0	1	1	1	0	1	0
187	$BB	1	0	1	1	1	0	1	1
188	$BC	1	0	1	1	1	1	0	0
189	$BD	1	0	1	1	1	1	0	1
190	$BE	1	0	1	1	1	1	1	0
191	$BF	1	0	1	1	1	1	1	1
192	$C0	1	1	0	0	0	0	0	0
193	$C1	1	1	0	0	0	0	0	1
194	$C2	1	1	0	0	0	0	1	0
195	$C3	1	1	0	0	0	0	1	1
196	$C4	1	1	0	0	0	1	0	0
197	$C5	1	1	0	0	0	1	0	1
198	$C6	1	1	0	0	0	1	1	0
199	$C7	1	1	0	0	0	1	1	1
200	$C8	1	1	0	0	1	0	0	0
201	$C9	1	1	0	0	1	0	0	1
202	$CA	1	1	0	0	1	0	1	0
203	$CB	1	1	0	0	1	0	1	1
204	$CC	1	1	0	0	1	1	0	0
205	$CD	1	1	0	0	1	1	0	1
206	$CE	1	1	0	0	1	1	1	0
207	$CF	1	1	0	0	1	1	1	1
208	$D0	1	1	0	1	0	0	0	0
209	$D1	1	1	0	1	0	0	0	1
210	$D2	1	1	0	1	0	0	1	0
211	$D3	1	1	0	1	0	0	1	1
212	$D4	1	1	0	1	0	1	0	0
213	$D5	1	1	0	1	0	1	0	1
214	$D6	1	1	0	1	0	1	1	0
215	$D7	1	1	0	1	0	1	1	1
216	$D8	1	1	0	1	1	0	0	0
217	$D9	1	1	0	1	1	0	0	1

DECIMAL	HEXADECIMAL	BINARY BIT							
		7	6	5	4	3	2	1	0
218	$DA	1	1	0	1	1	0	1	0
219	$DB	1	1	0	1	1	0	1	1
220	$DC	1	1	0	1	1	1	0	0
221	$DD	1	1	0	1	1	1	0	1
222	$DE	1	1	0	1	1	1	1	0
223	$DF	1	1	0	1	1	1	1	1
224	$E0	1	1	1	0	0	0	0	0
225	$E1	1	1	1	0	0	0	0	1
226	$E2	1	1	1	0	0	0	1	0
227	$E3	1	1	1	0	0	0	1	1
228	$E4	1	1	1	0	0	1	0	0
229	$E5	1	1	1	0	0	1	0	1
230	$E6	1	1	1	0	0	1	1	0
231	$E7	1	1	1	0	0	1	1	1
232	$E8	1	1	1	0	1	0	0	0
233	$E9	1	1	1	0	1	0	0	1
234	$EA	1	1	1	0	1	0	1	0
235	$EB	1	1	1	0	1	0	1	1
236	$EC	1	1	1	0	1	1	0	0
237	$ED	1	1	1	0	1	1	0	1
238	$EE	1	1	1	0	1	1	1	0
239	$EF	1	1	1	0	1	1	1	1
240	$F0	1	1	1	1	0	0	0	0
241	$F1	1	1	1	1	0	0	0	1
242	$F2	1	1	1	1	0	0	1	0
243	$F3	1	1	1	1	0	0	1	1
244	$F4	1	1	1	1	0	1	0	0
245	$F5	1	1	1	1	0	1	0	1
246	$F6	1	1	1	1	0	1	1	0
247	$F7	1	1	1	1	0	1	1	1
248	$F8	1	1	1	1	1	0	0	0
249	$F9	1	1	1	1	1	0	0	1
250	$FA	1	1	1	1	1	0	1	0
251	$FB	1	1	1	1	1	0	1	1
252	$FC	1	1	1	1	1	1	0	0
253	$FD	1	1	1	1	1	1	0	1
254	$FE	1	1	1	1	1	1	1	0
255	$FF	1	1	1	1	1	1	1	1

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